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environmental assessment
reconstruct east entrance road

YELLOWSTONE NATIONAL PARK
WYOMING·MONTANA·IDAHO

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environmental assessment
reconstruct east entrance road

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draft
june 1992

YELLOWSTONE NATIONAL PARK • WYOMING - MONTANA - IDAHO

UNITED STATES DEPARTMENT OF THE INTERIOR / NATIONAL PARK SERVICE

SUMMARY

The east entrance road is in an advanced state of deterioration. Pavement is rutted and breaking due to poor drainage, poor quality base material, and increasingly heavy vehicle use. Safety hazards include narrow pavement width, inadequate visibility at turnouts and intersections, steep side slopes, water hazards, rockfalls, and curve alignments that do not meet modern engineering safety standards.

Reconstruction of the east entrance road between the Fishing Bridge junction and the east entrance is proposed. Construction would occur in numerous construction phases over a five- to eight-year period. The preferred alternative would reconstruct and widen the road to a 30-foot pavement width, which would provide 11-foot travel lanes and 4-foot paved shoulders. Other alternatives include reconstructing the road to a 22-foot pavement width, which would provide 11-foot travel lanes and minimum gravel shoulders. A no-action alternative is also analyzed. The existing road alignment would be followed, but some intersections, turnouts, and curves would be reconfigured to improve safety as part of the preferred alternative. Other problems such as rockfall, poor drainage, and lack of guardrails would be corrected. Approximately 1.5 million cubic yards of rock talus would be excavated from Sylvan Pass and processed into aggregate to supply this project and other park road projects for the next five to ten years. Road improvements would provide a safer and more enjoyable driving experience for park visitors.

About 150 acres of soil and vegetation and 0.2 acre of geothermal area would be disturbed. A special road design would be implemented in geothermal areas to reduce impacts. Approximately 7.3 acres of wetland would be filled. Following removal of existing road and embankment fill, 4.2 acres would be restored. A net loss of 3.1 acres would result. Wetland restoration and improvement of fish passage and resultant spawning following replacement of four impassable culverts would compensate for the loss of wetlands from construction. Protection of wildlife, including endangered, threatened, and special concern species, would be provided by construction stipulations and mitigation measures included in construction contracts; no significant impacts are anticipated.

Some historic and prehistoric material would be lost. Cultural resources eligible for listing on the National Register of Historic Places (NRHP) would be protected, preserved, and maintained according to the programmatic agreement currently being developed. Mitigation and data recovery plans would be prepared for any potentially impacted NRHP-eligible archeological resource. Reconstruction of historic structures would be conducted in accordance with *The Secretary of Interior's Standards for Rehabilitation* or would be documented according to Historic American Engineering Record (HAER) standards. All plans would be submitted to the Wyoming State Historic Preservation Office (SHPO) and the Advisory Council on Historic Preservation (ACHP) for review and comment. The east entrance road is entirely located within the state of Wyoming, so neither Montana nor Idaho state historic preservation offices would be involved.

Visitors would encounter 30-minute traffic delays, night traffic closures during the summer, day and night closures after Labor Day, and total closure after October 1 for several years.

Address comments to: Superintendent, Yellowstone National Park, P.O. Box 168
Yellowstone National Park, WY 82190

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INTRODUCTION

The National Park Service, in cooperation with the Federal Highway Administration (FHWA), is in the process of rehabilitating or reconstructing the primary roads in Yellowstone National Park. This process began in 1982 with passage of the Surface Transportation Assistance Act (P.L. 97-424), which established the Federal Lands Highways Program. This program distributes funds from federal motor fuel tax revenue for work on roads in parks and other federally administered lands. Reconstruction of the park road between Old Faithful and West Thumb and recent paving overlay work south of Lake are examples of work performed under this program.

The proposed reconstruction of the east entrance road between the Fishing Bridge intersection and East Entrance is the next major project under this program. Work would begin in late 1992 and occur in numerous construction phases for the next five to eight years. This document describes the proposed project, alternatives considered, and the associated environmental impacts.

The Parkwide Road Improvement Plan/Environmental Assessment (EA), which describes the overall parkwide road reconstruction program that is expected to continue over the next 20 years or more, has been issued. This Parkwide Road Improvement Plan/EA will serve as the foundation for future route-specific EAs, such as this document, which will be developed to further analyze effects of specific projects as design information becomes available.

PURPOSE OF AND NEED FOR THIS PROJECT

The east entrance road connects the central portion of Yellowstone and the Grand Loop road system to U.S. Highway 14/20 and the regional road network. This provides a highway corridor between Yellowstone National Park and the communities of Cody and others in central Wyoming. The east entrance road was conceived and originally constructed by the U.S. Army Corps of Engineers. Initial construction was completed in 1903. The road was reconstructed in 1939-1940 and the segment from Sylvan Pass to East Entrance was reconstructed again in 1965-1966.

According to NPS visitor use data, over 162,000 vehicles (16.7% of the total vehicles entering the park and representing ½ million visitors) entered the park at East Entrance in 1990. The western portion of the east entrance road had an average daily traffic (ADT) of 3,700 vehicles in 1985, and the rest of the road had an ADT of 2,500 vehicles. The projected ADT for the year 2005 is 4,500 vehicles for the western portion of the road and 3,100 vehicles for the remainder. *Park Road Standards* (NPS, 1984) specifies minimum widths of 11 feet per lane and 3-4 feet for shoulders for an ADT of 1000-8000.

Large vehicles (including buses, trucks, and recreational vehicles) make up about 13 percent of the traffic volume. The Department of Transportation increased the maximum legal width of motor vehicles in the 1980s to 8 feet, 6 inches. Side mirrors extend beyond this width. The number of large buses is expected to increase due to the upward trend in senior citizen and foreign group tour visitation.

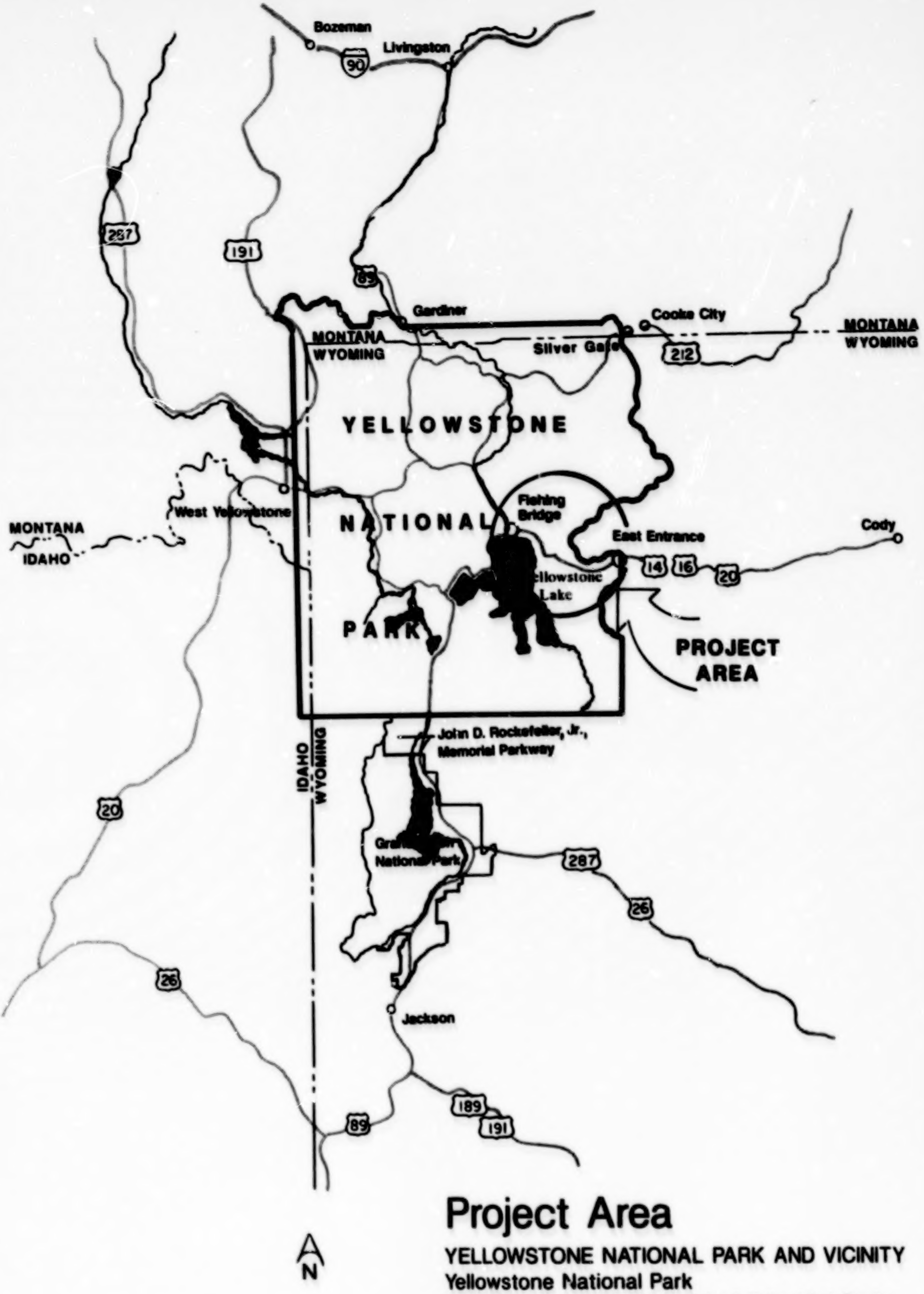
Crosscountry bicyclists use the park roads in addition to visitors who transport bicycles to the park for short, local bike trips. Bicycle traffic volume is unrecorded.

The existing condition of the road is generally poor. The pavement width varies from 22 to 24 feet, and much of the road has abrupt pavement edges and no shoulders. The asphalt pavement surface is rough and breaking up, with numerous potholes, cracks, and frost boils. Most of the complaint letters from visitors to the park concern rough road surfaces.

This road is typical of the older roads in Yellowstone that have not been reconstructed since World War II. The top width and base material were not designed to accommodate the greater traffic volume or the wider and heavier vehicles of today. Typical of the older park roads, surface break up is accelerating and maintenance costs are escalating just to keep the road passable.

Drainage deficiencies contribute to rough and rutted pavement. Ditches and culverts are inadequate to carry moisture away from the road base material. A high percentage of the road base material is of poor quality, with an excessive proportion of fine material that wicks water into the base structure. Moisture in the base material contributes to excessive flexing and damage to the pavement surface, resulting in rutting and broken pavement. Some culverts act as barriers to spawning trout.

A number of safety problems result from the current road design. Some turnouts and intersections have poor sight distance for drivers entering traffic. Bicyclists are often in danger due to the narrow roadway. Some segments of the road do not comply with current safety engineering standards for curve configurations. Guardrails are constructed of inadequate materials or are nonexistent in areas with steep dropoffs. Other hazards are posed by fixed objects such as trees or rocks close to traffic lanes, and by vegetation that screens wildlife approaching the road. Ditches are generally inadequate and do not prevent rockfall from hitting travel lanes. These safety problems diminish the enjoyment of traveling the road, require a greater than normal amount of driver concentration, and contribute to accidents. Existing conditions also increase maintenance costs.



Project Area

YELLOWSTONE NATIONAL PARK AND VICINITY
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ALTERNATIVES CONSIDERED

ALTERNATIVE A: PROPOSAL - RECONSTRUCT ROADWAY WITH 30-FOOT PAVEMENT WIDTH

Road Design

The design has been prepared in three segments. Segment A would extend from Fishing Bridge to the Lake Butte overlook intersection, segment B from Lake Butte overlook to Sylvan Pass, and segment C from Sylvan Pass to East Entrance (see map). The 26-mile road and auxiliary features would be reconstructed in numerous contract phases and would last between five and eight years.

Reconstruction of the road would provide a pavement width of 30 feet consisting of 11-foot travel lanes and 4-foot paved shoulders separated by painted edge lines. The existing road alignment would be followed. Several intersections and turnouts would be reconfigured or removed to improve sight distance and safety. Some curves would be realigned to correct hazards and, where practicable, provide an appropriate design speed.

The design speed of the road from four miles east of Fishing Bridge to Fishing Bridge would be 45 miles per hour. Most of the remainder of the road, including curves, would be designed at 40 mph; some sections of reduced sight distance or potential traffic congestion at 30-35 mph; and the curves near Cub Creek at 25-30 mph. The posted speed limit for the majority of the road would be 40 mph, although areas of significantly less design speed, such as near Cub Creek, would be posted accordingly.

The base structure would be repaired by excavation and replacement of poor quality base material with better draining aggregate. The base would also be widened by excavation of cut slopes and addition of embankment fill. Less material and fewer surface acres would generally be disturbed by widening into cut slopes above the road than by extending embankment fill slopes. Whenever possible road base widening would be confined to one side with the center line shifted accordingly to avoid important natural or cultural features, or to avoid large cut and fill slopes along the roadside. Center line shifts would be dependent on existing road geometry and would comply with standard safety design principles.

Maximum cuts would measure 120 feet and maximum fills would measure 80 feet. Excavation into stable cliffs would be made at steep angles to reduce disturbance. Slope tops would be rounded back to reduce rockfall, and wide ditches would be provided at the bottom to catch falling rock. Dirt slopes would be flattened (slope angle reduced) where required to reduce soil ravel and promote revegetation. Material excavated from cut slopes would be used as common fill material along the roadway.

Portions of road with steep embankment slopes or water hazards would be evaluated for safety engineering standards. Fill would be added to flatten slopes or guardrails would be installed to reduce vehicle rollover hazard. Adding embankment fill to flatten the slope angle would meet safety requirements without the addition of guardrails in some cases. Log guardrails would be removed and replaced with w-section weathering steel, mounted on round timber posts.

Culverts and ditches would be improved and/or added where necessary to correct drainage problems. Pipe culverts would be replaced and lengthened to compensate for a wider road base. Culverts with existing stone masonry headwalls would be evaluated for visibility from the roadway or adjacent visitor attractions, and headwalls that contribute to visitor experience or are considered to be important cultural resources would be marked, dismantled, and reconstructed after pipe replacement. Headwalls that are not readily seen by the public or that are not of value culturally would not be replaced, and the stone would be used elsewhere.

Roadside geothermal features would be avoided where possible by shifting the centerline away from the feature. Where small geothermal areas could not be avoided, a specific pavement design would be implemented. This design would include a 2-foot subgrade followed by a vapor barrier (to prevent the upward movement of water), four inches of sand, 12 inches of 4-inch rock (to minimize heat transference), crushed aggregate base, and pavement.

The surface of Fishing Bridge would be repaired by replacing deteriorated asphalt tiles. The Pelican Creek, Sedge Creek, and Cub Creek bridges would be replaced or reconstructed.

The existing causeway fill and bridge across Pelican Creek and the adjacent wetlands would be replaced by a 1500-foot viaduct of concrete and steel. Traffic would continue to use the existing road and bridge while the new viaduct was being constructed alongside. After construction, the existing road fill and bridge would be removed, and the site would be restored to natural grade and rehabilitated.

The Sedge Creek bridge, which is made of a concrete deck with solid rock abutments, would be replaced with a wider and possibly longer structure to enhance the natural meander of Sedge Creek. The existing rock abutments would be reused in the new bridge structure.

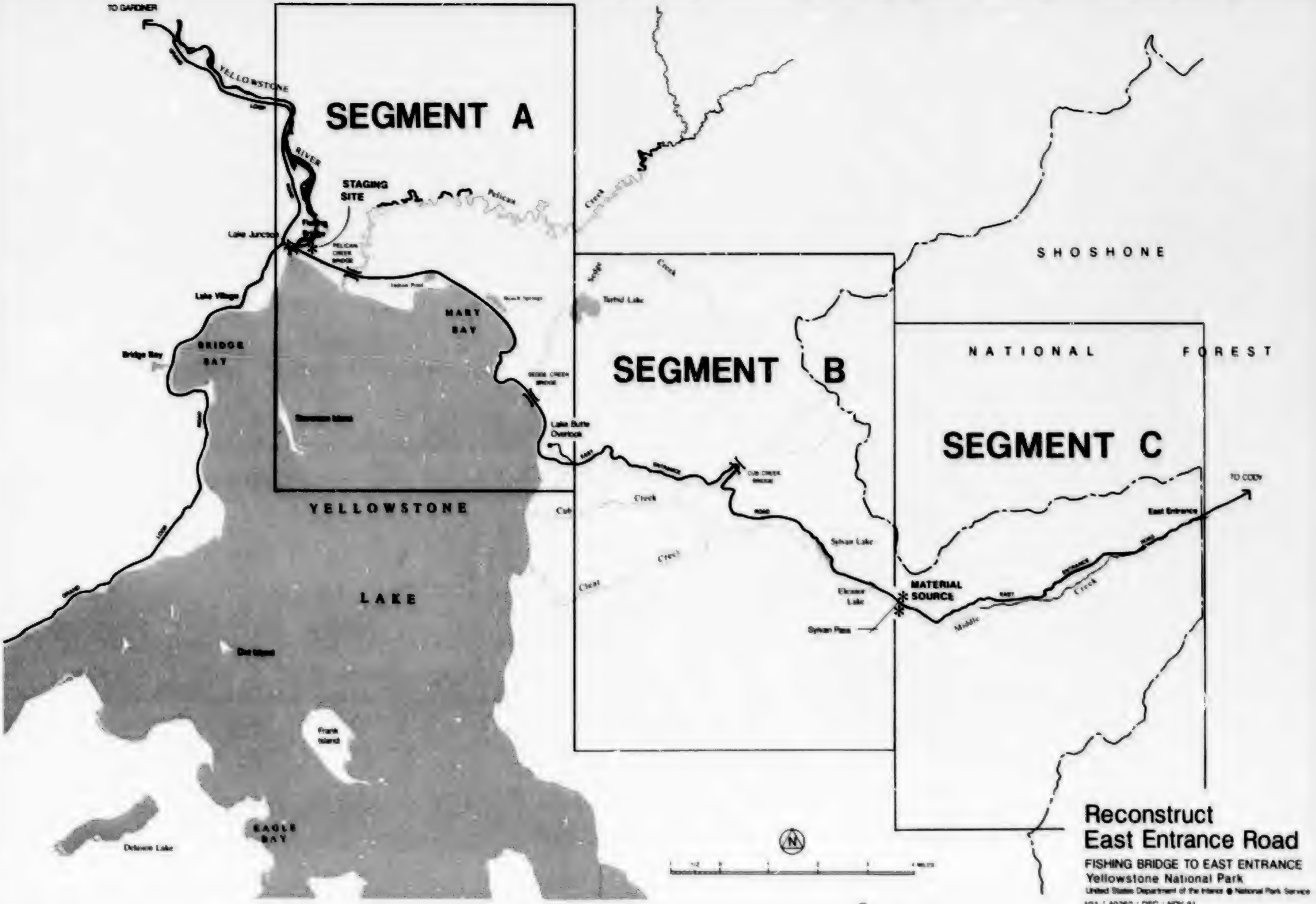
The Cub Creek bridge, an open bottom arch culvert with stone facing, would be reconstructed and widened. The stone would be removed and replaced on the face of the new concrete core.

Portions of Yellowstone Lake shoreline along Mary Bay may be reinforced with rip-rap material to protect the road embankment from high storm waves.

The intersection at the Nine Mile trailhead would be reconfigured to improve the sight distance for vehicles entering and exiting this area.

Road widening at Sylvan Lake would occur by widening into the cut slope. No fill would be placed in Sylvan Lake.

A 0.2 mile portion of Clear Creek east of Sylvan Lake may be rechanneled and reinforced with rip-rap to protect the road base. Clear Creek currently meanders on both sides of the road, which is apparently a result of past road design. Rechanneling would be required along a 400-foot segment just west of Lake Eleanor and along a 500-foot segment midway between Lake Eleanor and Sylvan Lake. Along the 400-foot segment, large unstable rock slopes prohibit further cuts. Consequently, the road would be realigned closer to the stream channel and the stream channel would be rerouted approximately 25 feet away from the road. Along the 500-foot segment, an existing meander would be filled and a new channel established in an adjacent wet meadow, essentially creating a new meander in place of the existing one. Riprap would be placed on



Reconstruct East Entrance Road

FISHING BRIDGE TO EAST ENTRANCE

Yellowstone National Park

United States Department of the Interior ● National Park Service

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roadbanks close to stream channels and meanders to prevent erosion. Disrupted vegetation and habitat would be restored. Riparian wetlands would be restored to original conditions.

Road widening at Lake Eleanor, a seasonally dry lake, would require placing fill along 500 feet of shoreline adjacent to the road. Fill depth, material type, and slope angle would be designed to promote wetland vegetation and provide a buffer for wildlife movements.

The deteriorating portions of the stone guardwall east of Sylvan Pass would be replaced by compatible masonry.

Short segments of the Middle Creek streambank would be reinforced with rip-rap to prevent erosion of road embankment material. The existing road embankment extends into a portion of Middle Creek below the ordinary high water line.

Clearing forest for right-of-way widening would be done so that an irregular forest edge remains. Minimal vista clearing would be performed at selected areas to improve views from the highway.

Material Source

Rock would be excavated from talus slopes on both sides of the road at Sylvan Pass and processed into paving aggregate and road base material. Approximately 1.5 million cubic yards of rock material would be excavated and removed. About 400,000 cubic yards of material would be used for the east entrance road and the remainder would be hauled to other storage sites such as Fishing Bridge, Bridge Bay, or Canyon and stockpiled for subsequent park road reconstruction projects.

Material was excavated at this site in the past and unnatural flat areas and other landforms remain. The existing road follows an approximately 30-foot deep notch that was cut through the talus during this previous extraction activity. The surface would be reconfigured during material excavation to create a more natural appearance. The existing flat bench, which was created during past material extraction activity above and south of the road at the pass, would be excavated and lowered nearly to the existing road elevation. The large flat surface north of the road would be reduced in size and manipulated to appear more naturally sloping. The talus slopes at the east end of the pass would be excavated and lowered to meet the existing road surface.

Staging Sites

Sylvan Pass would be used as the site for material processing and concrete/asphalt production for all phases of this project. Material processing would consist of mechanically crushing, sorting, washing, and stockpiling aggregate. Asphalt would be produced by mixing the aggregate with oil in a hot mix or batch plant and would be hauled to the application area while hot.

The 5-acre disturbed site at Fishing Bridge immediately north of Hamilton's store may be used for stockpiling, crushing, and concrete/asphalt production (batch plant) during the course of construction for segment A and during reconstruction of the Pelican Creek viaduct. No excavation is planned in the area. Results of a cultural resources survey of this area, scheduled for the summer of 1992, would be used for design of the staging site to avoid or reduce impacts. Protective measures such as berms, fences, or hardened surfaces would be developed to prevent damage to subsurface resources during material storage. Rehabilitation of this area would occur upon completion of segment A and the Pelican Creek viaduct.

The previously impacted 2-acre site upstream of the Cub Creek bridge may be used for storage of construction vehicles and materials during segment B. No oil or food would be stored nor a would a batch plant be operated there. Traffic in and out of the staging area would be kept to a minimum. An operation plan would stress that, under normal circumstances, traffic would be limited to picking up equipment and materials at the beginning of nightly shifts and returning equipment at the end of shifts until August 1 of each year. This staging site must be rehabilitated at the completion of segment B to promote reestablishment of grizzly bear use of the area.

The 1-acre Sylvan Lake pit site may also be used for storage of construction vehicles and materials during construction of segment B. No oil or food would be stored nor a batch plant operated there. The Soil Conservation Service SNOTEL snow pillow and electronic equipment would not be disturbed. A zone of at least 50 feet around the snow pillow would be kept free of trucks, gravel, and any other equipment or material that could change the snow deposition patterns in that area. The area would be rehabilitated following its use as a staging site for this project.

Staging operations for construction of segment C would occur at Sylvan Pass or in the vicinity of the east entrance housing and administrative area.

There would be no use of the old Pelican Creek campground, the Turbid Lake road, the Pelican Valley trailhead, the floodplain of the Yellowstone River, the sewage treatment plant road near Fishing Bridge, the former NPS Fishing Bridge campground (except to recover asphalt from the internal roads), the areas that have regrown along rabbit curve, or the abandoned road along Middle Creek near the east entrance for staging, batch plant operations, or other purposes. Additionally, no major staging, outside of parking, would occur at the Avalanche Peak trailhead at the west end of Lake Eleanor. No enlargement would be made of this trailhead/parking area. The site would be rehabilitated to improve the flow of a side stream into Clear Creek and to reduce the possibility of overflow into the picnic/parking area.

Previously disturbed areas used for material extraction or staging areas during the project would be rehabilitated in conjunction with this project.

Housing

No additional housing, trailer, or office space construction would occur because of this project. These needs would be accommodated as covered in the Lake/Bridge Bay plans, or as provided in other park housing/administrative areas. With the exception of security guards, there would be no employee camping at staging areas or along the project.

Scheduling of Work Activities

Following is the proposed general schedule of road closures and openings. It allows for construction activities and hauling of material from Sylvan Pass to stockpile areas. This schedule also provides for mitigation of disturbance to wildlife and includes the results of discussions with the Cody Country Chamber of Commerce.

Spring opening to June 15	Road work would be done during daylight hours only. Delays would not exceed 30 minutes
June 16 through Labor Day	The road would be closed each night from 9 P.M. to 9 A.M.
Labor Day to October 1	The road would be open from 8 until 11 A.M. and from 7 until 10 P.M., but would be closed at night and during the middle of the day.
October 1 until winter	The road would be closed to visitors for the season. Work would proceed until prevented by weather.

Within the general schedule above, the following specific stipulations would also be implemented:

- No work would occur at night before June 15 annually from Fishing Bridge junction to Lake Butte.
- No work would occur prior to July 15 annually at Beach Springs Lagoon/Mary Bay (from the open/non-forested area beginning approximately ¼ mile west of lagoon to the pond on the lake side of the road) to avoid potential disturbance of foraging bald eagles and nesting trumpeter swans.
- No work on the Lake Butte overlook road would begin prior to July 1 annually.
- Work on the road segment within 1 mile in either direction from the bridge over Cub Creek and on the bridge/culvert at Cub Creek would not begin prior to August 1 annually.
- Stream-related construction and the removal and replacement of culverts in tributaries used by spawning cutthroat would be conducted after July 15 annually, probably during September and October. This includes the Yellowstone River, Pelican Creek, Cub Creek, the Cub Creek tributary immediately west of the main stem, the Clear Creek tributary immediately west of Sylvan Lake, and the two unnamed tributaries to Sylvan Lake
- Work would begin at the Lake Butte end of the segment during spring and early summer to lessen potential disturbance to grizzly bears feeding on carcasses and traveling along the lakeshore to and from spawning streams and elk calving areas.

Reclamation

A reclamation and revegetation management plan would be prepared by park staff and funded and implemented as part of the road reconstruction project. The park policy is to conserve topsoil and salvage vegetation for reclamation of disturbed areas (see appendix A, Vegetation Management). During construction topsoil would be salvaged by grading and would be stored in windrows for later use where practical. No imported topsoil would be used in reclamation. Native plant material would be used for revegetation. Strategies would be developed for managing exotic plant species that may become established after construction. Standard, approved erosion control techniques and structures would be implemented after completion of construction. Reclamation would be performed at the Fishing Bridge, Cub Creek and Sylvan Lake pit processing/staging sites. Implementation of sensitive landscape designs would minimize impacts to archeological resources during grading or other ground-disturbing activities associated with area reclamation at the Fishing Bridge staging site.

Cost

Implementing this alternative, including material excavation and processing, construction, and reclamation, would require $33-35 million.

Construction Stipulations and Mitigation

During construction, standard erosion control precautions, as outlined under Section 204 of *Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects* and specified within the road design documents, would be implemented. Refraining from work activities during periods of high runoff would also aid in preventing excessive erosion during construction.

Prior to construction existing geological benchmarks would be relocated away from the road by personnel of the Cascades Volcano Observatory of the U.S. Geological Survey (USGS).

Processing/staging sites and activities would be limited to those described in alternative A, and scheduling of excavation, hauling, and construction activities would adhere to that outlined in alternative A.

Soil would be salvaged by grading, stored in windrows, and used during reclamation where practical to reduce long-term soil loss.

The geothermal road design described under alternative A would be used to reduce impacts caused by construction of the roadway through geothermal areas.

Several methods would be employed to mitigate impacts to wetlands from construction. Wherever possible the road would be designed to avoid wetlands. Wetlands supported by seep areas and steep drainages east of Sylvan Pass would be disturbed by road cuts, but are expected to reestablish following construction activities. Removal of existing road and embankment fill would result in restoration of some wetlands. In particular, the construction of a raised viaduct over Pelican Creek, as opposed to replacement of the present causeway and bridge, would result in the removal of the existing causeway fill and enable restoration of 1.2 acres of highly valuable sedge marsh wetland. Replacement of four impassable culverts in tributaries used by spawning cutthroat would improve trout spawning and reproduction success and aid in reducing the loss of wetland values from filling during reconstruction.

All contracted, NPS, and FHWA employees would receive training on safety and proper sanitation in bear country. Included would be information about bear management areas, the closure of spawning streams to human entry and fishing until July 15, and special measures that affect living and working in Yellowstone National Park. Temporary work stoppages may be necessary to avoid or resolve a potential or existing grizzly bear/human conflict. All food storage and security measures would be enforced at construction sites and staging areas. Areas where employees might have food must have bear-proof garbage cans installed and maintained for the course of the construction. Proper sanitation and handling and storage of garbage and other attractants would be strictly enforced.

"SLOW - WILDLIFE CROSSING" signs would be placed on an experimental basis as needed after construction of the east entrance road, such as at the Nine Mile trailhead crossing, the Cub Creek area, Sylvan Lake, and Middle Creek. The speed limit would be reduced if roadkill problems developed.

Cultural resources that contribute to the historic significance of the park road system that are expected to be nominated to the NRHP would be protected, preserved, and maintained according to the programmatic agreement currently being developed between FHWA, the staff of Yellowstone National Park, the Rocky Mountain Regional Office, and the SHPOs of Wyoming and Montana.

Reconstruction of the road and staging areas would be designed to avoid archeologically or ethnographically sensitive sites wherever possible. If any archeological site, which is determined eligible for listing on the NRHP (previously identified or yet to be surveyed), would be unavoidably impacted by construction activities, then an approved mitigation plan would be developed and appropriate data recovery completed prior to initiation of ground-disturbing activity. The data recovery plan, prepared pursuant to the ACHP's publication *Treatment of Archeological Properties*, would be submitted to the Wyoming SHPO and the ACHP for review and comment prior to the initiation of any actual data recovery.

Results of the scheduled survey of the proposed Fishing Bridge staging site would be used for design of the configuration of the staging area to avoid or reduce impacts. Protective measures such as berms, fences, or hardened surfaces would be developed to prevent damage to subsurface archeological resources during material storage. Sensitive landscape designs would be implemented during reclamation to minimize impacts to archeological resources during grading or other ground-disturbing activities. If disturbance of resources is unavoidable, mitigating strategies such as archeological monitoring or other provisions would be developed and transmitted to the Wyoming SHPO and the ACHP for their review and comment.

Reconstruction or rehabilitation of any historic structure would be conducted in accordance with *The Secretary of Interior's Standards for Rehabilitation*. Loss of any historic structure would be mitigated by documentation according to Historic American Engineering Record (HAER) standards.

All contracted, NPS, and FHWA employees would receive training on protocol for cultural resources.

inconvenience to visitors from road closures and traffic delays associated with reconstruction would be alleviated by a public information program.

Contract stipulations would preclude contractor employee camps outside of existing park residential or camping areas although 24-hour security guards might be assigned to staging areas.

ALTERNATIVE B: RECONSTRUCT ROADWAY WITH 22-FOOT PAVEMENT WIDTH

A 22-foot-wide paved roadway providing 11-foot travel lanes and minimal gravel shoulders would be constructed as described under the proposal. Much of the base material would be excavated and replaced with better quality material. Cut slopes would be excavated to reduce rockfall and provide wider rockfall ditches along the road. Ditches and culverts would be reconstructed to improve drainage. The bridges crossing Pelican, Sedge, and Cub creeks would not be widened. The Pelican Creek bridge could need structural repair due to poor condition of the existing bridge.

Evaluation and treatment of turnouts, slope flattening, guardrail installation, material excavation, material processing, staging sites, revegetation, exotic plant control, erosion control, contractor training and housing, and construction scheduling would be the same as described in the proposal. Additionally, mitigation measures listed under alternative A pertinent to the construction activities for this alternative would be identical.

Implementing this alternative, including material excavation and processing, construction, and reclamation, would require approximately $16 million.

ALTERNATIVE C: NO ACTION

No major reconstruction work would occur in the near future. Existing use and maintenance of the road and auxiliary features would continue. Maintenance activities such as pothole patching, periodic chip and seal coat applications, and removal of rockfall and slumping debris would continue. No modifications of alignments, slopes, turnouts, bridges, culverts, walls, guardrails, signs, or material excavation would be made.

ALTERNATIVES CONSIDERED BUT REJECTED

Repaving

Repaving the existing road was considered but rejected. The condition of the base material and poor side drainage would result in the breakup of the new pavement surface within five to ten years. Safety engineering deficiencies would not be corrected. This was considered unacceptable for visitor use, an unwise expenditure of public funds, and would assume liability due to expenditure of construction funds without complying with current engineering standards.

Varying-width Construction

A road design with varying widths was considered, with narrow sections to reduce disturbance of adjacent natural or cultural features. This was rejected due to the inherent hazards of a road with inconsistent widths and to the preference of the National Park Service for adhering, wherever practicable, to the preferred road design of a 30-foot pavement width throughout Yellowstone National Park.

Alternative Material Sources

Alternative material sources were considered but rejected. No commercial or privately owned material sources were identified near the east entrance area. Two sources on Forest Service land were identified, sampled, and tested by the FHWA. Both sources failed to meet current federal specifications for material quality, although the state of Wyoming plans to develop one of the sites, Mummy Cave Pit, as the principal source for construction of US Highway 14/20 through the Shoshone National Forest east of the park. (*Yellowstone National Park Materials Source Study*, preliminary draft, November 1990, FHWA). Acceptable out-of-park sources are situated beyond the northeast, north, west or south entrances of the park, at least 68 miles from the project site. These sources are considered impractical due to long haul distances, travel time, increased traffic congestion, road deterioration, potential for accidents, possible exhaustion of local material sources, and high transportation costs. Impacts to out-of-park material sources would generally be comparable to those from extraction inside the park because out-of-park sources are located in the Greater Yellowstone Area (GYA) and have comparable natural and cultural resource components and attributes. Compliance and reclamation requirements would have been the same as those for actions occurring on park lands.

AFFECTED ENVIRONMENT

NATURAL RESOURCES

Geologic Features

Fishing Bridge and Yellowstone Lake lay on the east edge of the Yellowstone caldera, a depression formed by a volcanic explosion 600,000 years ago. Substrate at Fishing Bridge consists of glacially deposited gravel covering rhyolite, ash, and welded ash flows. Indian Pond and Turbid Lake east of Fishing Bridge are two of at least ten hydrothermal explosion craters in Yellowstone Park. From Lake Butte viewpoint to Sylvan Pass, welded ash flows overlap older andesitic volcanic deposits. In the vicinity of Sylvan Pass, talus slopes of andesite and breccia occur along the road. Glacial, river, and stream sediments replace the volcanic flows and talus both east and west of the pass.

Geologic benchmarks have been placed along the east entrance road by the Cascades Volcano Observatory of the USGS for volcano deformation studies. Benchmarks are located at 0.6 mile intervals between Fishing Bridge and two miles north of Lake Butte and at 1-mile intervals between Lake Butte and East Entrance.

The existing roadway traverses many steep slopes. Some slopes are bedrock cliffs that were altered by past blasting and excavation for road construction. Some steep slopes are composed of talus rock that tends to generate rockfall.

Thermal Features

Thermal features are a result of geologic events including volcanism in Yellowstone. Some geothermal activity, primarily in the form of vents and small springs, occurs along the east entrance road at Pelican Creek, Beach Springs, Indian Pond, Mary Bay, Sedge Bay, Steamboat Point, and the area west of Cub Creek. Mary and Sedge Bays are particularly active thermally because superheated groundwater lies close to the surface. Highly acidic soils, a consequence of geothermal activity, are also present in small amounts at these sites.

Soils

Soils near the road along Yellowstone Lake are mostly poorly developed and generally are silty sand intermixed with glacial till. The soils east of the lake are generally thin and loamy, and derived from glacial till. At Sylvan Pass and on both sides of the pass are extensive talus slopes devoid of soil.

Air Quality

Air quality and visibility are generally excellent. Yellowstone is a mandatory Class 1 area where air quality degradation is unacceptable under the Clean Air Act of 1977. Air quality is monitored at the Lake Ranger Station.

Water Quality

Water quality in the area is excellent with near pristine headwater conditions. Some natural turbidity occurs in streams from high runoff during June and early July.

Water Resources

The east entrance road parallels the shoreline of Yellowstone Lake for nine miles and crosses bridges over the Yellowstone River, Sedge Creek, Pelican Creek, and Cub Creek.

The normal surface elevation of Yellowstone Lake is 7733 feet above sea level, and high water elevation is 7737 feet. Storm winds drive waves against the eastern and northeastern shores of the lake, and high seasonal water levels combined with wave action currently erode slopes immediately below the road as well as road embankments that extend to the shoreline. During periods of high water the lake backs up into Pelican and Sedge creeks and elevates creek levels at the bridges. Because the lake level fluctuates only a few feet, there has never been a hazardous flood at the bridges.

Cub Creek is a small stream that drains a moderate area and crosses under the road through a large culvert.

Clear Creek lies adjacent to the road east of Sylvan Lake and splits into meandering courses on each side of the road for about ¼ mile. The stream abuts the road embankment slopes in several locations. Floods in this drainage could erode embankments; however, this segment of the creek is near its headwaters and water volumes have been low.

Middle Creek flows east from Sylvan Pass, but the road is perched high on the valley slope above the stream until the last mile before East Entrance. This creek drains a large mountain valley with a steep stream gradient. Historical flooding in this 1-mile segment has eroded the roadway embankment in the past, and the stream channel has shifted many times.

Wetlands

Wetland plant communities in Yellowstone include wet meadow, grassland riparian, shrubby riparian, and wet forest habitats. Grassland riparian habitats are most often sedge marshes or bogs of water sedge, inflated sedge, and beaked sedge. Along the east entrance road the largest areas of sedge marshes are at Pelican Creek, Sedge Creek, and Sylvan Lake. Shrubby riparian habitats are usually dominated by willows, alders, and sedges and are found along streams and near seeps. Associated ground cover plants are mosses, reedgrasses, sedges, monkeyflower, arrowleaf groundsel, monkshood, cow parsnip, and western mountain aster. Shrubby wetlands often colonize ditches and cut slope seeps created by the road. Some wetlands of this type were also created by the damming of moisture on the upslope side of the road due to the inadequate drainage. Dominant species in wet forest habitat are subalpine fir and Engelmann spruce, with understory species including horsetail, bluejoint reedgrass, trapper's tea, twisted-stalk, arrowleaf groundsel, and a variety of mosses. Wet forests are present from Yellowstone Lake to Lake Butte overlook, at the geothermal area west of Cub Creek, along Cub Creek, and near East Entrance.

Vegetation

Three major vegetation zones are found along the road and include spruce/fir, lodgepole pine, and Douglas-fir zones. The spruce/fir zone is dominated by forests composed of Engelmann spruce and subalpine fir, with stand age varying from young to mature. Young stands are typically dominated by lodgepole pine. Older stands can have a mixture with lodgepole and, at higher elevations, whitebark pine. These forests grow predominately on soils derived from andesitic rock formations. The lodgepole pine zone is dominated by lodgepole pine with sparse spruce, fir, and whitebark pine. These forests grow predominately on soils derived from rhyolite. The Douglas-fir zone is dominated by Douglas-fir, with snowberry understory common in younger stands. Douglas-fir stands are frequently intermixed with stands of sagebrush and grasses.

State Protected Plants

There are no federally listed threatened or endangered plant species near the east entrance road. The following plant species listed by the state of Wyoming are found near the road.

Common Name	Botanical Name
Greater red Indian paintbrush	*Castilleja crista-gaeli*
Brewer's monkeyflower	*Mimulus breweri*
Barclay's willow	*Salix barclayi*

Wildlife

Yellowstone is home to a wide variety of wildlife. Over 60 species of mammals, more than 290 species of birds, five species of reptiles, four species of amphibians, and many native and introduced species of fish inhabit the park.

Ungulates. Ungulates such as elk, moose, bison, and mule deer use the east entrance road corridor, but no critical habitat has been documented in the area. There appear to be no established ungulate crossings of the east entrance road nor any migration routes across Sylvan Pass.

Elk use the roadside habitat very little during the summer, with the exception of the road corridor east of Sylvan Pass along Middle Creek. A local elk herd of 150-200 individuals winters in Pelican Valley and calve there from mid-May until late June.

Bison frequent Mary and Sedge Bays, especially the Beach Springs area, due to its geothermal nature during winter and spring and, to some extent, during the summer. These are primarily groups of bulls, although mixed groups also use the lakeshores of these bays in the spring depending on the severity of the winter and on population levels. Bison calve in Pelican Valley during the first two weeks of May and feed there through the summer and fall.

Moose frequent willow stands, sloughs, ponds, and other wetlands along the east entrance road. The Pelican Creek drainage provides excellent moose habitat. Moose calve in Pelican Valley from mid-May until early June.

Mule deer are common in meadows at Fishing Bridge and along Yellowstone Lake, and use habitat east of Sylvan Pass along Middle Creek.

Bighorn sheep summer along the crest of the Absarokas and are occasionally sighted on the ridges high above the east entrance road. Bighorn use the Sylvan Pass area very little, and crossing there appears to be infrequent and sporadic. No important natural attractants, such as food or escape cover, are found near the road corridor.

Other Mammals. Black bears are widely distributed throughout the park; no reliable population estimates are available. Most reported black bear activity along the east entrance road occurs near Mary and Sedge Bays, Lake Butte, Holmes Point, Cub Creek, and Middle Creek. Important food sources are carrion and spawning trout in the spring and whitebark pine nuts in the fall. Black bears are most often found in forested areas and meadows are generally dominated by grizzlies, although there is some habitat overlap. Black bears are active primarily at dawn and dusk, with some activity during the day as well.

Coyotes are seen regularly along major roadways, such as the east entrance road, the north shore of Yellowstone Lake, and Pelican Creek. They range seasonally throughout the park, but are most often seen in grasslands and meadows where they hunt rodents.

Pine martens, weasels, and a wide variety of rodents are common throughout the area of the east entrance road. Beaver have occupied portions of Middle Creek away from the road during some years. Otters live along the lakeshore near Steamboat Point and throughout Sedge Bay. Cougar, bobcat, and lynx may also inhabit the area.

Birds. A wide variety of species, including great gray owl, American widgeon, bufflehead, Barrow's goldeneye, mallard, lesser scaup, green-winged teal, redhead, and canvasback, use many areas along the east entrance road, especially near Fishing Bridge and Yellowstone Lake. The Fishing Bridge area supports great gray owls, Canada geese, goldeneyes, and white pelicans. Wetlands of lower Pelican Creek near Yellowstone Lake provide important waterfowl habitat. Pelican Valley is used by shorebirds and ducks. Indian Pond, Mary Bay, the associated Beach Springs area, and Sedge Bay support waterfowl. Indian Pond is used by loons during migration. The geothermal nature of many of these locations causes early spring opening of the water, which attracts many bird species.

Fish. The native Yellowstone cutthroat is the only trout species that occurs in Yellowstone Lake and its tributaries in the park. Mature cutthroat ascend tributary streams from late April to early August to spawn, with timing dependent on runoff conditions. Eggs typically hatch in 25-30 days, juveniles emerge in two weeks, and the fry migrate downstream to Yellowstone Lake several days or weeks later.

Spawning streams crossed by the road are the Yellowstone River, Pelican Creek, Cub Creek, an unnamed Cub Creek tributary immediately west of the main stem, an unnamed Clear Creek tributary immediately west of Sylvan Lake, and two unnamed tributaries to Sylvan Lake. Culverts form barriers and block fish passage during spawning at Cub Creek, the Cub Creek tributary immediately west of the main stem, and the two unnamed tributaries to Sylvan Lake.

Endangered and Threatened Species

Four species protected under provisions of the Endangered Species Act of 1973 (as amended) are present in Yellowstone National Park. The grizzly bear (*Ursus arctos horribilis*) is classified as threatened. The bald eagle (*Haliaeetus leucocephalus*), the peregrine falcon (*Falco peregrinus*), and the whooping crane (*Grus americana*) are listed as endangered.

Grizzly Bear. Preservation of the grizzly bear and its habitat is one of the highest priorities for Yellowstone National Park management. The entire park, other than small tracts surrounding developed areas, is designated as Management Situation 1, as described in the *Grizzly Bear Recovery Plan* (USFWS 1982) in which grizzly habitat and its preservation receive the highest priority. Management decisions favor the needs of the grizzly bear when grizzly habitat and other uses compete. Land uses that could impact grizzlies or their habitat must be made compatible with grizzly needs or such uses are eliminated.

Much of the east entrance road lies within primary grizzly bear habitat. The Fishing Bridge area is one of the park's most ecologically diverse and most valuable to the grizzly bear. It is also an important travel corridor for grizzlies moving around Yellowstone Lake and between the Absaroka Mountains and areas north of Mount Washburn, which also contain important habitat.

Grizzlies are highly mobile and cross road corridors on a daily and seasonal basis in search of food. They prefer road crossings with adjacent dense forest cover. The east entrance road corridor from Sedge Bay to Sylvan Pass is densely forested and grizzlies are thought to frequently cross the road in this section. No grizzlies have been killed by vehicles on the east entrance road in the last five years.

Grizzlies are active day and night during early spring and again later in autumn when food is relatively scarce. From late spring through summer when food is relatively abundant, they often rest during daylight hours and feed at dawn, dusk, and at night. They are opportunistic and omnivorous. Undisturbed feeding on carrion, spawning cutthroat, elk calves, and any other available natural food is critical for grizzlies after they emerge from hibernation. Grizzlies feed on winter-killed ungulate carrion from mid-March through May in Pelican Valley and along the road corridor from Fishing Bridge junction to Lake Butte. Grizzlies prey on elk calves from mid-May to early June in Pelican Valley and fish for spawning cutthroat from approximately late April through mid-August in Yellowstone Lake tributary streams. These include Clear Creek and its tributaries, the northernmost reaches of Pelican Creek (well away from the road corridor), and a segment of Cub Creek from its mouth at Yellowstone Lake to 1 mile south of the east entrance road. The density of spawning cutthroat in Cub Creek decreases appreciably north of that segment resulting in very little use of the creek near the road. Grizzlies do not feed on spawning fish in the Yellowstone River because the river is large and predation success is low.

Grizzlies feed on succulent vegetation from mid-summer through fall in high elevation meadows along the east shore and north of the east entrance road. They also feed heavily on whitebark pine nuts, huckleberry, and biscuitroot from Sylvan Pass to the east entrance in September and October as they accumulate fat reserves in preparation for hibernation.

Bald Eagles. Resident and migratory bald eagles use the park. There are 14 bald eagle breeding territories in the park. Known nests are at least 1 mile away from the east entrance road. Park personnel believe eagle populations to be generally stable and possibly at maximum density.

Resident bald eagles begin defending territories in late January, display courtship behavior in February, and begin nesting, laying eggs, and incubating in March and April. Chicks hatch in May and June and fledge in July. During this entire period bald eagles are especially sensitive to disturbance by humans.

Bald eagles prey on waterfowl and fish during the nesting season, and waterfowl and carrion during the winter months. Eagles feed on spring carrion along Mary Bay, on cutthroat trout in Yellowstone Lake, on spawning cutthroat trout in Yellowstone Lake tributaries, and on waterfowl at Pelican Creek, Mary Bay, Sedge Bay, and Indian Pond. Roost sites are found at Mary Bay, Holmes Point, Steamboat Point, and Sedge Bay.

Peregrine Falcon. Peregrine falcons are summer residents in Yellowstone from April through October, nesting on large cliffs that overlook rivers or valleys where prey is abundant. Park personnel believe that peregrine populations are stable and at maximum density after a successful reintroduction program. Peregrines hunt along Pelican Creek and Pelican Valley, Mary Bay, and Indian Pond and use perch sites along Yellowstone Lake.

Whooping Crane. Whooping cranes are summer residents of Yellowstone. The whooping crane population in the greater Yellowstone ecosystem is centered on Gray's Lake National Wildlife Refuge in Idaho. Historical evidence of whooping cranes nesting in Yellowstone does exist, but the information does not constitute a legitimate nesting record. The park population rarely exceeds two individuals.

Candidate Species

The following species are Category 2 species, which are those for which current information indicates that listing as threatened or endangered is possibly appropriate, but for which conclusive data on biological vulnerability and threat are not available.

Wolverine. The wolverine is a wide-ranging, mid-sized carnivore, generally solitary in nature, that preys or scavenges on other mammals such as ungulates. Some evidence exists to suggest that a breeding population of wolverine exists in the GYA, although abundance and distribution have not been documented. Wolverine reported in the park may occur seasonally or have home ranges that extend beyond park boundaries.

Lynx. The lynx, a mid-sized carnivore, is wide-ranging, uses habitat in dense forests away from traveled areas, is generally solitary in nature, and preys or scavenges on other mammals. Its resident breeding status in the park is uncertain, although sightings have been reported throughout the park's history. It is generally impossible to verify the reliability of sightings since the bobcat, a species very similar in appearance, is known to be present.

Spotted Bat. The spotted bat has not been documented in Yellowstone, although suitable habitat exists in the park. The western big-eared bat, which generally lives in caves, has been collected in the Mammoth area and may be widely distributed in the park.

Preble's Shrew. One verified specimen of Preble's shrew was trapped years ago in the park. An attempt in 1986 to capture more specimens in an area near the Lamar Ranger Station was unsuccessful. The shrew favors sage/bunch grass communities. Additionally, riparian corridors through varying habitats could serve as a migration corridor. No information exists on its distribution or abundance in the park.

Arctic Grayling. The arctic grayling exists in several lakes in Yellowstone. A fluvial form historically occurred in the Madison River drainage and below the barrier falls in the Firehole and Gibbon rivers. The fluvial arctic grayling is now very rare in the upper Missouri River basin and may no longer occur in Yellowstone. The park is therefore considering a plan to restore fluvial arctic grayling in several streams.

Bird Species. Category 2 bird species include the ferruginous hawk, the mountain plover, the long-billed curlew, and the burrowing owl, all of which are rarely recorded in the park.

None of these species are known to frequent the area along or near the road.

Species of Special Management Concern

The trumpeter swan is a species of special management concern in Yellowstone and the state of Wyoming. The Fishing Bridge area is used by trumpeter swans all year. Of the approximately nine pair that nest in the park, one or two pair nest yearly at Beach Springs. The slow flowing open water habitat required for swan survival can increase with geothermal activity, but even in Yellowstone this habitat becomes scarce during the coldest part of winter. Swans are easily disturbed during breeding, egg-laying, and incubation, which occur from mid- to late June. Juvenile swans mature slowly and fledge late. The severe climate of the GYA often results in poor reproduction. This area is marginal trumpeter swan habitat.

CULTURAL RESOURCES

Archeological and Ethnographic Resources

For at least 10,000 years, Native Americans occupied the Greater Yellowstone Area. Euro-american occupation of the area began in the 19th century. Traces of Yellowstone's human history exist today as prehistoric and historic sites and artifacts, the majority of which are related to prehistoric and historic Native Americans and Euro-americans. The park may also contain areas and sites of special religious importance.

In 1989 the National Park Service conducted an intensive archeological survey and inventory for the east entrance road from Fishing Bridge to East Entrance. The survey was conducted according to *The Secretary of the Interior Standards for Archeology and Historic Preservation* (NPS 1990). Fourteen new prehistoric sites were found during the survey as well as an Euro-american site from about 1920-1930. The Fishing Bridge vicinity had been previously inventoried for archeological sites in 1958 and 1959 (Condon 1949; Malouf 1958, 1965; Hoffman 1961; Taylor et al. 1964). Limited testing of the Fishing Bridge area for water and sewer lines was completed in 1980 and the results were reported by Reeve in 1987. Cumulatively, including earlier surveys, there are 25 known archeological sites along the east entrance road. These sites range in age from the early twentieth century to 10,000 years before present.

Seven prehistoric and two Euro-american sites were tested in 1990 based on their proximity to the road and likelihood of being affected by road rehabilitation. Six of the prehistoric sites were recommended as potentially eligible for national register inclusion. A determination of eligibility was requested from the Wyoming SHPO and on April 2, 1991, concurrence with the NPS recommendation was received. Testing for preparation of data recovery plans for four sites occurred in 1990. Only three of the four sites (48YE701, 48YE696, and 48YE697) were determined to require data recovery. In 1991 limited testing occurred at sites 48YE304 and 48YE1.

The area along Clear Creek east of Sylvan Lake has been surveyed with negative results. No further archeological work is necessary prior to rechanneling in this area.

Further surveys and testing are scheduled for the proposed Fishing Bridge staging site during the summer of 1992 because staging activities could affect site 48YE1. The extent of impacts to buried components has not been determined, although the sites have been disturbed by modern use. Previous work in the area produced evidence of deeply buried deposits.

Consultation with American Indians has begun in order to identify areas of ethnographic concern. Thus sensitive sites can be avoided during construction.

Historic Resources

Road access within Yellowstone and the design of the Grand Loop road was a major issue during the first decade of the park's existence. The earliest road development, which began under the civilian superintendents, became the responsibility of the U.S. Army Corps of Engineers for over 30 years, beginning in 1882. For a few years National Park Service engineers supervised the road projects until a joint agreement was signed with the Bureau of Public Roads (later renamed the FHWA) in 1926. The character of the roads has changed over the years from the horse-drawn vehicle era to the automobile age. The first major road projects were in the 1920s and 1930s. The last major road project was during the Mission 66 period in the 1960s and 1970s.

The east entrance road, the Grand Loop road, and other entrance roads are being nominated as separate historic districts for listing on the NRHP. In conjunction with this nomination all of the historic bridges in Yellowstone National Park were recorded by an HAER team. These include Fishing Bridge (completed in 1937), Pelican Creek Bridge (completed in 1935), Sedge Creek Bridge (completed in 1935), and Cub Creek Bridge (completed in 1928). Measured drawings were completed for Fishing Bridge and Cub Creek Bridge. All four of these bridges were photographed to HAER standards.

Other features of the east entrance road that are older than 50 years and that contribute to its historic significance include stone masonry retaining walls, masonry guardwalls, culverts with stone masonry headwalls, and the road alignment itself. Over the years many of the stone guardwalls have been reconstructed or repaired. All of the wooden guardrails are modern and have been replaced within the last 20 years.

Corkscrew Bridge, an old masonry bridge built in 1919 (site 48YE734), is situated adjacent to the modern road just east of Sylvan Pass. In 1991 the Midwest Archeological Center recorded this bridge. The bridge needs to be assessed by an historic architect for stability and damage that could be incurred by increased heavy equipment movement and falling debris associated with road construction.

Social and Economic Environment

Yellowstone is accessible from the east via Cody, Wyoming on US Highway 14/20. The town of Cody (population 7,800) is 53 miles east of East Entrance and provides a wide range of services. Tourism is an important component of Cody's economy. Other limited food, lodging, and automotive services are provided by several lodges and resorts between Cody and East Entrance, and at the park concession complex 27 miles west of East Entrance. The Fishing Bridge, Lake Village, and Bridge Bay concession complex provides stores, gas, vehicle repairs, lodging, camping, restaurant, marina, and hospital facilities.

National Park Service visitor use data indicates that over 162,000 vehicles (16.7% of the total vehicles entering the park) entered the park's east entrance in 1990. This represented ½ million visitors.

The economic viability of some tourism-oriented businesses located in and outside the park is dependent on business from the east entrance road. The park road is open to normal summer traffic from about May 1 through October 31, with oversnow vehicle traffic traveling during the winter months.

The Wyoming Highway Department is planning reconstruction of Highway 14/20 west of Cody from the east boundary of the Shoshone National Forest to East Entrance. This project would occur during approximately the same time span as the proposed reconstruction of the park road.

IMPACTS OF ALTERNATIVE A: PROPOSAL

Natural Resources

Rock and Soil Surfaces.

Analysis — Bedrock cliff faces would be drilled, blasted, and excavated for road widening into cut slopes above the existing road at numerous points where the road traverses steep slopes between Yellowstone Lake and East Entrance. The majority of surface disturbed would be on slopes previously disturbed by past road construction. Talus slopes above the road would also be affected by excavation for road widening. Approximately 60 acres of roadside bedrock and talus slopes devoid of soil and vegetation would be disturbed by excavation for widening.

Approximately 10 acres of talus slopes at Sylvan Pass adjacent to the existing road would be disturbed by excavation and removal of approximately 1.5 million cubic yards of talus rock. Excavation and resloping of previously disturbed areas would result in more natural-appearing slopes adjacent to the road. There is no soil in this area.

Approximately 150 acres of roadside dirt-surfaced slopes supporting vegetation (see below) would be disturbed by grading, excavation, or burial under fill material. Redistribution of salvaged soil would reduce long-term soil loss. Approximately 60 percent of disturbance would be on slopes previously disturbed by construction.

Prior to construction, personnel of the Cascades Volcano Observatory of the USGS would relocate benchmarks away from the road.

Conclusion — Approximately 60 acres of talus and bedrock would be disturbed by drilling, blasting, and excavation. Excavation and removal of 1.5 million cubic yards of talus road at Sylvan Pass would affect 10 acres of previously disturbed talus, resulting in more naturally shaped slopes near the road. Approximately 150 acres of roadside dirt-surfaced slopes would be disturbed by construction clearing, grading, excavation, or fill placement. Roughly 60 percent of this area was previously disturbed. Geologic benchmarks would be relocated, preserving their function.

Thermal Features.

Analysis — Construction activities would encroach upon approximately 0.2 acre of active and inactive geothermal vents and geothermally altered soils along Mary Bay, Sedge Bay, Steamboat Point, and the geothermal area west of Cub Creek. No geysers or hot springs would be affected. The geothermal road design described under alternative A would be used where paved road surface would run directly over this 0.2 acre.

No violations of the Old Faithful Protection Act of 1991 would occur. This legislation prohibits any new development that would involve extraction or use of geothermal fluids, which would not occur. Reconstruction of existing disturbed areas and potential impact to 0.2 acre of geothermal features is preferable to rerouting the road near more pristine areas.

Conclusion — Construction activities would encroach upon approximately 0.2 acre of active and inactive geothermal vents and geothermally altered soils.

Air Quality.

Analysis — Effects on air quality would be short term and limited to the duration of construction. Dispersed dust and mobile exhaust emissions would result from truck traffic and equipment activity. Material processing at Sylvan Pass and Fishing Bridge would generate dust plumes from rock crushing and material screening. These plumes would be visible from the main road near the site during construction periods. Hydrocarbon emissions would occur at hot mix plants for asphalt production at Sylvan Pass and Fishing Bridge during paving operations. Dust and hydrocarbons would not be in sufficient quantities to significantly degrade park air quality. All contractor activities would comply with state and federal air quality regulations and operate under applicable permits.

Conclusion — Effects on air quality would be temporary in nature and there would be no significant impact on park or regional air quality or visibility.

Visual Quality.

Analysis — Views from the lake and other areas where the road is visible have been considered in the design and revegetation plans. The effects of construction on the visual quality of the roadside landscape would be of both short term and long term in nature. Short-term impacts from construction disturbance would include bare dirt and rock, disturbed cut and fill slopes, heavy equipment, material stockpiles, and dust plumes from material processing at Sylvan Pass and Fishing Bridge. Disturbed dirt slopes would take two to three years to revegetate. Where there is soil, moisture conditions are generally conducive for plant growth on moderate slopes. Gently sloping areas have more short-term visual impact because they are typically greater in extent than steeper slopes; moderate slopes are more conducive to plant growth and result in less long-term visual impact. Although soils and climate differ, revegetation of disturbed slopes on the Craig Pass road between Old Faithful and West Thumb has been satisfactory and similar results are expected along the east entrance road.

Contractor operations at Sylvan Pass would be visible from the road during the construction period. Excavation of material, rock crushing equipment with a dust plume, material stockpiles, asphalt hot-mix plant, and trucks and other parked equipment would be visible from about 1 mile of roadway during a five- to eight-year period. Material excavation activity would be concentrated in the first few years; however, staging activity would continue at Sylvan Pass for the duration of the five- to eight-year project. Stored equipment and limited material stockpiles would be visible near the Cub Creek bridge. A staging site north of the Fishing Bridge store would be visible, including aggregate stockpiles, crusher, asphalt plant, and stored equipment.

The long-term visual effects of road reconstruction would be influenced by the new design appearance of the wider pavement top width, segments of weathered steel guardrailing, reconstructed bridges, improved pullouts, and a slightly wider clear area between the road shoulder and forest edge. The recently reconstructed Craig Pass road provides an example of expected landscape effects.

Conclusion — Short-term effects from construction that would be visible to the public would be typical of road construction projects, including disturbed cut slopes, excavation and material processing at Sylvan pass, and material stockpiles in the Fishing Bridge area. Long-term visual effects would be similar to the appearance of the constructed right-of-way along the Craig Pass road. The visual quality of the roadside landscape is not expected to be impaired; in fact, previously disturbed slopes are anticipated to support increased vegetation following reclamation.

Water Quality

Analysis. Minor short-term siltation of small unnamed streams and ponds adjacent to the roadside may occur during culvert replacement and from erosion on disturbed slopes before vegetation becomes reestablished. Bridge reconstruction would also potentially affect Pelican and Sedge Creeks. Effects of the possible siltation would not be expected to be significant.

There would be no effect on the Yellowstone River from staging and material storage near Fishing Bridge nor from resurfacing the bridge.

Conclusion. Some minor short-term siltation may occur in small streams and ponds; however, there would be no expected significant effect. Scheduling and standard construction contract stipulations for erosion control are expected to prevent significant siltation.

Water Resources

Analysis. Placement of embankment fill and rip-rap into limited portions of streams and ponds would be necessary for road widening and embankment protection and would generally occur where past road construction altered adjacent water bodies. No significant impact on stream hydrology or ecology is anticipated.

Rechannelization of the two sites along Clear Creek would temporarily add sedimentation to the stream. Sedimentation would be minimized because work would take place during low streamflow in the fall. Vegetation and habitat would be disrupted during construction but would be restored after construction is completed. Streamflow would not be adversely affected, as the new stream channels would be similar to the existing ones. The sites are high in the Clear Creek drainage, so water volume is not great.

In compliance with the Clean Water Act, the FHWA would secure a Section 404 permit from the Army Corps of Engineers for placement of fill material into waters of the United States. A National Pollution Discharge Elimination System permit for storm water runoff would be secured from the Wyoming Department of Environmental Quality prior to construction.

Conclusion. No significant impact on stream hydrology or floodplain values is anticipated from limited placement of fill and riprap. The Clear Creek rechannelization would have no significant effect on vegetation, aquatic species, habitats, streamflow, or floodplain values.

Wetlands

Analysis. Roadside wetlands were surveyed and considered in engineering design to avoid impacts where possible. Early consultation regarding wetlands was made with the U.S. Fish and Wildlife Service, Army Corps of Engineers, and Environmental Protection Agency. Fill into wetlands would eliminate approximately 7.3 acres of wet meadows and moist forest wetlands. Approximately 4.2 acres would be restored resulting in a net loss of 3.1 acres of wetland.

Filling wetlands to widen the road base would be necessary in places where wetlands are found on both sides of the road. Retaining walls were considered as a method of reducing fill into wetlands, but guardrails would be required with retaining walls, requiring a wider road shoulder — therefore they would not result in the reduction of fill placement.

Removal of existing road and embankment fill would result in the restoration of 2.6 acres of wetland. Of these 2.6 acres, 1.2 acres of sedge marsh wetland would be restored following construction of a new raised viaduct over Pelican Creek and removal of the existing causeway. Currently, the causeway fill impedes waterflow across the valley drainage because only the stream channel is open. After removal of the existing fill, waterflow would no longer be restricted, which would facilitate flows during periods of flooding and high water.

Wetlands supported by seep areas and steep drainages east of Sylvan Pass would be disturbed by new road cuts. These wetlands were originally an outgrowth of previous disturbance to roadside cuts and therefore the disturbed wetlands, about 1.6 acres, are expected to reestablish following road development.

Replacement of four impassable culverts in tributaries used by spawning cutthroat would improve trout spawning and reproduction success and therefore aid in alleviating wetland values lost from filling during reconstruction.

The majority of the wetland type lost (approximately 60% of the 7.3 acres) would be wet meadow. The wet meadow habitat is the least productive wetland because it is wet for only a short time in the spring and has little or no value to aquatic species or waterfowl. Consequently, wetland values regained as a result of removal of the causeway fill at Pelican Creek and replacement of impassable culverts in spawning tributaries would aid in alleviating the loss of wetland acreage.

Conclusion. Approximately 7.3 acres of wetland would be filled to widen the road base. Removal of existing fill would restore 4.2 acres of wetland. The values of restored sedge marsh wetlands would be greater than those of the wet meadow sites lost. Wetland values would also be regained from the enhancement of trout spawning and reproduction as a result of replacement of impassable culverts. A net loss of 3.1 acres of wetlands would occur.

Vegetation

Analysis. Approximately 50 acres of predominantly spruce-fir forest and 100 acres of non-forested, predominantly meadow vegetation (excluding wetland vegetation), would be cut and cleared for road widening. Trees would be expected to regrow on much of the cleared forested area. Of the 100 acres of non-forested vegetation, approximately 60 percent are slopes that were reclamation. The above figure of 150 acres of total vegetation disturbance would occur on the same acreage described above for soil disturbance.

The reclamation of staging sites at Fishing Bridge, Cub Creek, and the Sylvan Lake pit site would restore native plant communities on eight acres of previously disturbed barren ground.

Colonies of state-listed plants, surveyed along the roadway, were considered in engineering design and would be avoided where possible. Barclay's willow would be affected along the east side of Sylvan Pass. The cut slopes would be cut further back, affecting the stream drainages and seeps where Barclay's willow grows. Loss of some of these plants would be mitigated by propagation and transplantation into the reestablished seep areas after completion of construction.

Conclusion — A total of 150 acres of vegetation would be cleared during construction, including 50 acres of forest. At least half of the disturbed acreage is expected to revegetate. A total of eight acres of previously disturbed staging sites would be restored to native vegetation.

Wildlife.

Analysis — Temporary displacement of wildlife and modification of use of the road corridor may occur due to the noise, dust, fumes, and light associated with construction activities. A small amount of roadside habitat for invertebrates, birds, and rodents would be permanently destroyed due to vegetation clearing and road widening. Some loss of individual small animals would be likely during construction. Wildlife foraging in the reclaimed areas along the reconstructed roadway and the reestablishment of migration and use patterns following construction would be anticipated. The disturbed roadway slopes would create more forest openings, which would result in the production of high quality vegetation and could attract wildlife to these areas.

The new wider pavement may have several influences on the vehicle/wildlife accident rate. Vehicle/wildlife accidents may initially decrease due to the improved visibility offered by the increased road width and cleared slopes. However, the vehicle/wildlife accident rate may increase due to faster traffic at dawn and dusk (due to the improved road condition) and potential increased presence of wildlife within the road corridor (due to the initial plant growth on revegetated slopes). In 10 to 20 years the benefits of improved sight distance may be reduced by the encroachment of trees along the road slopes. The overall, long-term trend of the vehicle/wildlife accident rate is impossible to predict. Further complicating the situation is the expected long-term increase in traffic volume (and number of accidents) as park visitation grows. "SLOW - WILDLIFE CROSSING" signs would be placed on an experimental basis as needed after construction of the east entrance road, such as at the Nine Mile trailhead crossing, the Cub Creek area, Sylvan Lake, and Middle Creek.

No disturbance to wildlife from material extraction activities and processing at Sylvan Pass is expected because the talus slopes there are of little value as wildlife habitat, and there is little if any animal movement across the pass via the road corridor. Staging activities at Fishing Bridge, Cub Creek, and Sylvan Lake may displace some wildlife from adjacent natural areas. In their current disturbed state, these areas do not provide good forage. Long-term forage conditions would be improved by reclamation at these sites.

Replacement of four impassable culverts in tributaries used by spawning cutthroat would improve trout spawning and reproduction success, indirectly improve a food source for consumers of trout, such as bears and bald eagles, and partially alleviate wetland values lost through impacts from filling during reconstruction. Stream-related construction and the removal and replacement of culverts in tributaries used by spawning cutthroat would be conducted after July 15 annually. These streams include Yellowstone River, Pelican Creek, Cub Creek, the Cub Creek tributary immediately west of the main stem, the Clear Creek tributary immediately west of Sylvan Lake, and the two unnamed tributaries to Sylvan Lake. The culverts in all the above streams would accommodate natural streambed bottoms. If construction caused minor increased turbidity or siltation, no significant effect on spawning cutthroat trout would be expected because spawning occurs during normally turbid spring runoff conditions.

Removal of the Pelican Creek causeway fill would allow unimpeded movement of large mammals, birds, fish, and other aquatic species up and down the drainage. Area available for bird nesting in this prime habitat would be increased.

Rechanneling the two sites along Clear Creek would temporarily affect aquatic species. Fish spawning, however, would not be affected because rechanneling would take place during low streamflow during the fall.

Conclusion — Effects of construction activities would be minor short-term displacement and minor long-term habitat loss, with no significant impact on wildlife populations. There may be potential for some long-term increase in vehicle/wildlife accident numbers; however, this is not expected to be significant and is also dependent on other variables such as long-term increases in traffic volume. Passage of spawning cutthroat trout through four road culverts would be permanently improved and would alleviate wetland values lost from filling during reconstruction.

Endangered and Threatened Species.

Grizzly Bear —

Analysis — primary concerns for impacts include:

(1) The potential displacement of bears from roadside habitat during road reconstruction.

(2) The potential of habituation of bears to people and/or human foods as a result of human presence, temporary contractor camps, and garbage that a project could bring into prime bear habitat. Both habituated and food conditioned bears often must eventually be removed due to the concern for human safety.

(3) The potential for bear roadkills due to increased average speed of vehicles traveling on the east entrance road. Grizzlies are known to cross roads along stretches bordered by thick forest cover while searching for and traveling between food sources, primarily during twilight and nighttime hours.

All park roads have been determined to displace grizzlies to some extent; however, grizzlies seem to habituate well to routine and predictable occurrences and traffic on park roads is firmly established. Construction activities, especially when commencing at dawn and ending at dusk or when continuing through the night, may displace grizzlies from the most efficient or preferred travel corridors. Minor temporary displacement in daily movements may also occur. These types of minor, temporary displacements are not expected to have a long-term adverse effect on the grizzly bear population. Nevertheless, temporary cessation of activities would be invoked if necessary to avoid or resolve a potential or existing grizzly bear/human conflict.

Avoiding preferred use areas and food sources, such as spawning trout, by implementing the seasonal and daily schedule outlined in "Construction Scheduling" would prevent significant displacement impacts. Grizzlies preying on elk calves in Pelican Valley would probably not be disturbed because of isolation from the road. Grizzlies foraging on vegetation on the east shore of Yellowstone Lake and in higher elevation areas north of the east entrance road would not be expected to be disturbed by construction.

Stipulations and enforcement of existing park regulations are expected to adequately prevent bear/human conflicts due to food, garbage, or general habituation. Proper handling and storage of food, garbage, and other attractants, including the installation, maintenance, and mandatory use of bear-proof garbage cans in the project area for the duration of construction, would be strictly enforced. Long-term food storage would be prohibited. Additionally, all contracted, NPS, and FHWA employees would receive training on safety and proper sanitation in bear country. Contract stipulations would preclude contractor employee camps outside of existing park residential or camping areas although security guards might need to be assigned to staging areas.

Following construction, the incidence of roadkills of grizzly bears and other wildlife could increase due to faster traffic on improved roads. Road slope clearing and some curve realignments would improve sight distances and the visibility of wildlife; however, the tendency for bears to cross roads in areas of thick cover could negate this benefit. The posted speed limit would increase from 35 miles per hour to 40 miles per hour with some exceptions near potentially hazardous areas such as curves. Historically, very few grizzlies have been killed by vehicles in the park; however, any loss due to roadkill is a concern and the grizzly population could decline if roadkills become chronic. Established traffic monitoring and accident reporting is considered adequate for assessing accident trends, and reduction of the speed or posting of warning signs could be implemented if problems develop.

Conclusion — Mitigation stipulations would be implemented to prevent disturbance during critical feeding times and in areas of critical use. Minor temporary disturbance in grizzly daily feeding and movement may occur; however, this is not expected to adversely affect grizzly bear populations. Mitigation stipulations and enforcement of existing park regulations are considered adequate to prevent habituation and food conditioning of grizzlies. The short-term effect of road reconstruction and long-term road structure and traffic would not be likely to adversely affect grizzly bear populations.

Bald Eagle —

Analysis — No construction activities would occur prior to July 15 annually at Beach Springs Lagoon/Mary Bay to ensure no effect on foraging bald eagles during that time. After July 15, eagles may be temporarily displaced in their daily movement, hunting, and feeding due to work activity; however, they are not considered as sensitive to disturbance after this date. No adverse impacts on nesting success for eagles is expected because known eagle nests are situated 1-2 miles from the road and young fledge prior to July 15. Bald eagles hunting ducks near Pelican Creek, Indian Pond, Beach Springs, Mary Bay, and Sedge Bay could be impacted due to changes in the road or pullouts or loss of potential roost trees in those areas.

Material extraction at Sylvan Pass and staging activities at Fishing Bridge, Cub Creek, and Sylvan Lake would not be likely to result in increased disturbance to bald eagles because these sites are not within important eagle habitat areas or are currently disturbed by the presence of humans and development. Vehicle traffic at the Fishing Bridge site would be removed after site reclamation.

Conclusion — Construction activities could affect the daily activities of bald eagles within the road corridor after July 15. No effect on nesting eagles is expected. The short-term effect of road construction and long-term use of the road would not be likely to adversely affect the continued existence of the bald eagle population.

Peregrine Falcon —

Analysis — Peregrine falcons might be temporarily displaced in their daily movement, hunting, and feeding due to construction activities. Impacts on nesting peregrine falcons would not be anticipated because no nests are known to be located near the east entrance road corridor. No impacts from work activities at Sylvan Pass, Fishing Bridge, Cub Creek, and Sylvan Lake are expected because peregrines do not appear to make significant use of these sites.

Conclusion — Construction activities may influence the daily use of resources within the road corridor by peregrine falcons. The short-term effect of road construction and long-term use of the road would probably not adversely affect the continued existence of the peregrine falcon population.

Whooping Crane —

Analysis — No effect on whooping cranes from road construction, material extraction, or staging activities would be expected because cranes are not known to inhabit any areas along the east entrance road corridor.

Conclusion — No effect on the continued existence of the whooping crane population is expected.

Candidate Species.

Analysis — The roadside habitat along the east entrance road does not appear to have significant use by candidate species. If there is use of the project area, impacts on these species would be expected to be comparable to those described for wildlife in general, such as minor displacement from roadside habitat and potential increase in vehicle/wildlife accident rates. No long-term adverse impacts on the populations of any of these species are expected.

Conclusion — No short- or long-term significant impacts on candidate species are anticipated.

Species of Special Management Concern.

Trumpeter Swan —

Analysis — No disturbance to nesting and feeding trumpeter swans in the vicinity of Beach Springs Lagoon/Mary Bay (where they have historically nested) would be expected because no construction work would occur there prior to July 15, and reconfiguration of the turnouts near the west end of Beach Springs Lagoon would reduce human disturbance to nesting swans. Later in the season trumpeter swans might be temporarily displaced in their daily feeding and movement due to construction activities. No impacts from extraction at Sylvan Pass or staging activities at Fishing Bridge, Cub Creek, and Sylvan Lake are expected because these sites do not support important trumpeter swan habitat.

Conclusion — Construction activities could temporarily affect daily feeding and movement of trumpeter swans along the road corridor after July 15. However, this is not expected to be a significant impact. No temporary impacts on nesting or any permanent adverse impacts on trumpeter swans are expected.

Cultural Resources

Archeological and Ethnographic Resources.

Analysis — Designs for road construction, including staging sites, pullouts, temporary access roads, and equipment storage areas were modified to avoid impacting the previously identified 25 archeologically sensitive areas wherever possible.

Four prehistoric sites cannot be avoided by construction because of topography. Data recovery plans would be done for three of these sites (48YE696, 48YE697, and 48YE701), which are eligible for the national register. Data recovery for these sites would take place during the summer of 1993 prior to initiation of ground-disturbing construction activities.

Road redesign at site 48YE304 near Fishing Bridge would prevent impacts on this site. Use of the Fishing Bridge area as a proposed stating site and subsequent rehabilitation of the area could potentially affect site 48YE1. Site 48YE1 would be inventoried and tested in 1992 to determine site boundaries. Archeological survey of the effected area would also precede construction of a bear-proof garbage room near Hamilton's store. Results of these investigations would be used to design the configuration of the staging site to avoid or reduce impacts. If the site could not be avoided, appropriate mitigation measures would be undertaken prior to any use that might impact site resources. Protective measures such as berms, fences, or hardened surfaces would be developed to prevent damage to subsurface resources during material storage.

Sensitive landscape designs would be implemented during reclamation of the proposed Fishing Bridge staging site to minimize impacts to archeological resources during grading or other ground-disturbing activities. If disturbance of resources is unavoidable, mitigating strategies such as archeological monitoring (or other provisions as previously discussed) would be developed and transmitted to the Wyoming SHPO and the ACHP for their review and comment.

The information gained from consultation with American Indians culturally linked to areas within the park would serve to guide project planning and design in such a manner so as not to impact sites or areas considered sacred by these groups. This information is regarded as confidential and is not available for release without the concurrence of the relevant modern day culture.

Conclusion — Archeological survey and evaluation of sites for NRHP potential would occur prior to construction. An approved mitigation plan would be developed and submitted to the Wyoming SHPO and the ACHP for review and comment followed by appropriate data recovery prior to any ground-disturbing activities. Information from consultation with relevant Indian tribes would help guide project planning and design to avoid sensitive ethnographic sites.

Historic Resources.

Analysis — Cultural resources that contribute to the historic significance of the park road system that are expected to be placed in the NRHP would be protected, preserved, and maintained according to the programmatic agreement being currently developed between FHWA, the staff of Yellowstone National Park, the Rocky Mountain Regional Office, and the SHPOs of Wyoming and Montana.

Reconstruction or rehabilitation of any historic structure would be conducted in accordance with *The Secretary of Interior's Standards for Rehabilitation*. Loss of any historic structure would be mitigated by HAER documentation.

Fishing Bridge structure and historic appearance would be unaffected by the replacement of deteriorated asphalt tiles.

Replacement of Pelican Creek Bridge, an NRHP-eligible property, would have an adverse effect on the structure.

Sedge Creek Bridge, made of a concrete deck with solid rock abutments, would be replaced with a wider and possibly longer structure. The existing rock abutments would be reused in the new bridge structure. Reconstruction would not adversely affect this structure.

Cub Creek bridge, an open-bottom arch culvert with stone facing, would be reconstructed and widened. The stone would be removed and replaced on the face of the new concrete core. Reconstruction would not adversely affect this structure.

Deteriorating portions of stone guardwalls at various locations would be replaced by compatible masonry.

Reconstruction of existing visible stone headwalls, in conjunction with culvert replacement, would mitigate adverse impacts.

Removal of 50-year-old (or older) stone culvert headwalls that are not readily visible would result in adverse effects. At least one representative culvert should be documented according to HAER standards. Documenting all lost headwalls would not be necessary.

Conclusion — Cultural resources would be protected, preserved, and maintained according to the programmatic agreement. Reconstruction or rehabilitation of any historic structure would be conducted in accordance with *The Secretary of Interior's Standards for Rehabilitation*. Loss of any historic structure would be mitigated by HAER documentation. Fishing Bridge's structure and historic appearance would be unaffected. The Pelican Creek bridge would be adversely affected by replacement with a modern structure. The Sedge Creek and Cub Creek bridges would be reconstructed. Stone guardwalls and headwalls would either be rehabilitated or removed.

HISTORIC PROPERTIES GENERAL DESCRIPTION

Yellowstone East Entrance Road: The entire road has been nominated as an Historic District for the NRHP (NRHP). The nomination is pending and is expected to be completed during 1992. The nomination forms identify all features on the east entrance road that contribute to its significance and specifically lists four bridges along the route as contributing structures. The following is a list of these contributing structures, their NRHP status, the impact of the proposal, protective measures outlined in the EA, and the rationale for the actions presented:

HISTORIC PROPERTY DESCRIPTION	NRHP STATUS	IMPACT OF PROPOSED ACTION	EA PROTECTIVE MEASURES	RATIONALE FOR ACTION
Fishing Bridge (HAER # WY-9)	Nomination pending, expected completion: 1992.	No effect: simple resurfacing. EA retains historic properties of structure.	The EA prescribes continued preventive maintenance and preservation.	Fishing Bridge design exemplifies harmony between nature and manmade road features as integral to NPS philosophy.
Pelican Creek Bridge (HAER # WY-49)	Nomination pending, expected completion: 1992.	Adverse effect: removal and replacement of the bridge.	The adverse effect would be mitigated through HAER documentation and construction of a new bridge compatible with the Secretary's Standards.	Pelican Creek Bridge is structurally unsound and would be replaced in the interests of safety.
Sedge Creek Bridge (HAER # WY-25)	Nomination pending, expected completion: 1992.	No adverse effect; widening of the bridge by moving its facade several feet over on one side.	Replacing one facade in the same configuration as before construction. Final result would be in accord with standards.	The road's narrowness in this place causes a safety problem. Widening the bridge would alleviate the problem.
Cub Creek Bridge (HAER # WY-25)	Nomination pending, expected completion: 1992.	No adverse effect; widening of the bridge by moving its facade several feet over on one side.	Replacing one side's facade in the same configuration as before construction. Final result would be in accord with the secretary's standards.	The road's narrowness in this place causes a safety problem. Widening the bridge would alleviate the problem.

ARCHEOLOGICAL SITES GENERAL DESCRIPTION

Yellowstone East Entrance Road: Of 23 known archeological sites adjacent to the east entrance road, five may be affected by construction work. None of the five sites is currently listed in the national register, but archeological work in the field during the summer of 1992 could result in nomination of one or more. The following is a list of these archeological sites, their NRHP status, the impact of the proposal, protective measures outlined in the EA, and the rationale for the actions presented.

ARCHEOLOGICAL SITE DESCRIPTION	NRHP STATUS	IMPACT OF PROPOSED ACTION	EA PROTECTIVE MEASURES	RATIONALE FOR ACTION
Archeological site #48YE1 [east of Fishing Bridge].	A determination of eligibility was requested from the Wyoming SHPO in March 1992.	Possible adverse impact [site vicinity east of Fishing Bridge is to be evaluated archeologically in early summer (1992) as a possible construction staging area. Intensive archeological inventorying would determine the boundaries.	Avoidance of site, if possible. Mitigation through salvage, if not possible. Staging area would be situated to avoid most, if not all, of site. Staging area would not disturb ground.	Other staging area sites inside the park would be too remote and therefore too expensive to use. Staging outside the park would have the same cost disadvantages.
Archeological site #48YE304 [west of Fishing Bridge].	A determination of eligibility was requested from the Wyoming SHPO in March 1992.	No effect.	Site west of Fishing Bridge would be avoided altogether by moving the road centerline several feet to the north.	Avoidance of the site atop a bench would preserve and protect its integrity.
Archeological site #48YE696 [near Steamboat Point].	Determined eligible, April 2, 1991.	No adverse effect of widening the road into area of site.	There would be no adverse effect of widening the road with data recovery.	Site cannot be avoided due to topography.
Archeological site #48YE697 [near Steamboat Point].	Determined eligible, April 2, 1991.	No adverse effect of widening the road into area of site.	There would be no adverse effect of widening the road with data recovery.	Site cannot be avoided due to topography.
Archeological site #48YE701 [near Steamboat Point].	Determined eligible, April 2, 1991.	No adverse effect of widening the road into area of site.	There would be no adverse effect of widening the road with data recovery.	Site cannot be avoided due to topography.

Social and Economic Environment

Analysis. Disturbance and inconvenience to park visitors, area residents, and businesses inside and outside of the park from construction of the park road would be short term each year and would occur over a five- to eight-year period. Visitors using the east entrance would find construction on US Highway 14/20 through the Shoshone National Forest at the same time. Social and economic impacts are difficult to accurately predict. The following are general effects.

Visitors traveling through the construction areas would experience short-term inconvenience during construction from rough roads, equipment noise, dust, fumes, 30-minute delays (or possibly longer) waiting for one-way traffic (with several events possible), and delays from slow traffic through active construction areas. The road would be opened and closed according to the proposed road openings/closings schedule described in alternative A in the traffic management section. Nighttime and late-season closures would facilitate contractor work and reduce the overall number of years required for construction completion. Inconvenience would be reduced by a public information program warning of delays and closures. Impacts on visual quality are described under "Natural Resources" above.

Long-term benefits for visitors would include improved safety for motorists and bicyclists with a reduction in accidents and vehicle damage due to the wider lanes and shoulders, improved safety characteristics of curve and intersection geometry, guardrail and embankment slopes designed to reduce rollover accidents, reduced rockfall hazard, elimination of fixed-object hazards, and improved sight distance achieved by clearing trees away from the road shoulder.

Road maintenance costs would be reduced or stabilized, allowing for use of maintenance monies elsewhere in the park.

Business in Park County and Cody, Wyoming, may benefit from expenditures in the local economy by the contractor and by contractor employees. This would be influenced by the location of the contractor base and by where employees are recruited. Visitor traffic is not expected to be significantly affected, and no reduction in tourist spending in Cody is expected due to road construction.

Concession businesses inside the park and businesses along the road outside the park would be affected by disruption of traffic. Traffic may be bunched up due to one-way traffic control, resulting in surges of customers arriving at roadside restaurants and stores. This effect would vary with the distance of active construction from various businesses. Daytime traffic would continue (with the possible exception of late fall, when most businesses are closed) and little if any reduction in over all visitor traffic and resulting business is expected.

Conclusion. Visitors traveling the road would experience short-term inconvenience from construction activity including 20-minute delays (or possible longer) for stretches of one-way traffic, possible night traffic closures, and possible closure of late fall traffic. Benefits would be long term and result from improved safety, smoother surface, and increased enjoyment for motorists and bicyclists. Businesses in or near the park and in Cody are not expected to be significantly impacted by construction activity.

Cumulative Impacts

The positive and negative impacts to natural, cultural, and socioeconomic resources associated with the original development of the roadway would persist. The original development of the road provided access to the park, enjoyment of its features, and financial expenditures both in and outside the park, but resulted in the destruction of bedrock, soils, and vegetation; destruction and fragmentation of habitat; disturbance and displacement of wildlife; possible loss of historic and prehistoric resources; and waste production.

Following reconstruction, the continued use of the existing roadway would result in perpetuation of park visitation and human presence. Road safety standards, driving comfort, and visual quality of the road corridor would be improved. These beneficial modifications could stimulate greater visitation resulting in increased traffic. The park accident rate could change as a result. The higher safety standards of the road and improved sight distance could act to decrease vehicle accidents; however, the improved road condition might also encourage travelers to drive faster than posted speeds, which could result in more accidents.

Use of the road would result in continued wildlife disturbance and roadkills. Vehicle/wildlife accidents might increase, and an increase in bear deaths is possible. The loss of one to two female grizzly bears per year could result in a downward trend for the population. This potential vehicle/wildlife accident rate increase would not be expected to affect the populations of other species, but it could result in the death of more individuals.

Ongoing maintenance of the road would lead to continuous use of aggregate sources, possibly from sites within the park, and disturbance to roadside soil and vegetation.

The reclamation of previously disturbed borrow and staging sites used during the project would increase available habitat and food for the park's wildlife, and could result in the long-term decrease of localized invasion of exotic species.

The Wyoming Highway Department is planning reconstruction of 25 miles of U.S. Highway 14/20 between East Entrance and the east boundary of the Shoshone National Forest. An environmental impact statement is being prepared for this project and a draft document is anticipated for review during the late summer or early fall of 1992. A planning document and environmental assessment are also being developed for renovation of the east entrance housing area. A 3.2-mile segment of the Grand Loop road north of West Thumb and the road between Madison Junction and Biscuit Basin would be reconstructed. Paving overlays would be applied to roads between the West Entrance and Madison Junction and between Norris and Canyon Junctions.

Implementation of the projects described above may take place concurrently with reconstruction of the east entrance road. Consequently, visitors may encounter numerous construction projects and longer delays as they travel through the park. Mitigation and project management measures, such as those described in this document, would be planned and implemented to reduce any significant impacts.

IMPACTS OF ALTERNATIVE B

Natural Resources

Rock And Soil Surfaces.

Analysis — Impacts from road reconstruction would be the same as described under alternative A, with cut slopes and embankments disturbed for reduction of rockfall, drainage ditch improvement, and culvert replacement. Approximately 45 acres of roadside bedrock and talus slopes would be disturbed by excavation.

Excavation of talus rock material from Sylvan Pass would have the same results as described under alternative A, with 10 acres of talus slopes disturbed and resloped.

Approximately 65 acres of roadside dirt-surfaced slopes would be disturbed by grading, excavation, or burial under fill placement. Vegetation growth on disturbed slopes is anticipated.

Conclusion — Approximately 45 acres of roadside bedrock and talus slopes would be disturbed by excavation, and 10 acres of talus (mostly previously disturbed surface) would be disturbed by removal of 1.5 million cubic yards of material from Sylvan Pass. Approximately 65 acres of roadside dirt slopes would be disturbed by slope construction, and most disturbed area would regrow.

Thermal Features.

Analysis — Construction activities would encroach upon approximately 0.1 acre of active and inactive geothermal vents and geothermally altered soils along Mary Bay, Sedge Bay, Steamboat Point, and the geothermal area west of Cub Creek. No geysers or hot springs would be affected. The geothermal road design described under alternative A would be used where paved road surface would run directly over this 0.1 acre. No violations of the Old Faithful Protection Act of 1991, which prohibits any new development that would involve extraction or use of geothermal fluids, would occur. Reconstruction on existing disturbed areas with potential impact to 0.1 acre of geothermal features is nevertheless preferable to rerouting the road near more pristine areas.

Conclusion — Construction activities would encroach upon approximately 0.1 acre of active and inactive geothermal vents and geothermally altered soils.

Air Quality.

Analysis — Effects on air quality would be the same as described in alternative A.

Conclusion — Effects on air quality would be temporary in nature and there would be no significant impact on park or regional air quality or visibility.

Visual Quality.

Analysis — Short-term impacts from construction activities and disturbance to slopes would be the same as described in alternative A. Long-term effects would be somewhat different due to the appearance of the narrower 22-foot pavement width of this alternative. Some visitors could consider this more appealing than a wider pavement. Bridges and stone walls would remain the same as existing conditions, but wooden guardrailing would be replaced with weathered steel guardrails.

Conclusion — Short-term visual impacts from construction would generally be the same as from alternative A, including disturbed roadside slopes, visible material excavation and processing at Sylvan Pass, and material stockpiles and processing near Fishing Bridge. The long-term appearance of the road would be different from alternative A due to a pavement width of 22 feet, compared to 30 feet for alternative A.

Water Quality.

Analysis — Potential for siltation of small streams and ponds adjacent to the roadway would be the same as alternative A. Preventative measures required in the contract are expected to be adequate to prevent significant adverse effects. No bridge work would affect Pelican Creek, Sedge Creek, or Cub Creek.

Conclusion — Some minor short-term siltation may occur in small streams and ponds, but this is not expected to be significant and standard construction contract stipulations for erosion control are expected to prevent significant siltation.

Water Resources.

Analysis — Placement of fill and rip-rap into limited portions of water bodies would occur as described under alternative A. No significant impact on stream hydrology or ecology is anticipated.

Conclusion — No significant impacts on stream hydrology or ecology are anticipated.

Wetlands.

Analysis — Fill would be placed into approximately 2.7 acres of wetland adjacent to the roadway, compared to 7.3 acres for alternative A. Approximately 1.7 acres of wetland would be restored by removal of existing embankment fill.

Conclusion — Approximately 2.7 acres of wetland would be destroyed by fill, and approximately 1.7 acres of wetland would be restored by removal of existing fill.

Vegetation.

Analysis — Approximately 15 acres of predominantly spruce-fir forest and approximately 50 acres of predominantly meadow vegetation (excluding wetland) would be cut and cleared for road slope and drainage construction. Much of the newly created slopes would revegetate with native plants.

Conclusion — A total of approximately 65 acres of vegetation would be removed during construction, including 15 acres of forest.

Wildlife.

Analysis — Displacement of wildlife from roadside habitat and habitat loss from vegetation modification would be the same as described under alternative A, with no significant impact on populations.

The narrower road of alternative B would have the same posted speed (predominantly 40 miles per hour) as alternative A; however, average vehicle speed may be less than with a wider pavement surface, with possibly less potential for roadkills. Vehicle traffic volume would continue to increase with park visitation and could affect wildlife, but this would be independent of road reconstruction. This effect cannot be measured and no significant wildlife mortality is anticipated with this road design width.

Spawning conditions would be improved and wetland values lost from filling during reconstruction would be alleviated by replacement of culverts at four streams as described in alternative A.

Conclusion — No significant short- or long-term impacts on wildlife are anticipated from construction activity. Trout spawning would be improved and wetland values lost from filling during reconstruction alleviated by replacement of four culverts.

Endangered Species.

Analysis — The potential for construction activity to cause disturbance or displacement from food sources affecting grizzly bear, bald eagle, and peregrine falcon would be the same as described in alternative A.

Conclusion — Construction with mitigation measures proposed in alternative B would not be likely to adversely affect grizzly bear, bald eagle, or peregrine falcon. There would be no effect on whooping crane.

Candidate Species.

Analysis — As described under alternative A, no candidate species are known to make significant use of roadside habitat; therefore, no effect from construction is anticipated.

Conclusion — No significant impact on candidate species is expected.

Species of Special Management Concern.

Trumpeter Swan —

> Analysis — Potential for disturbance from construction activity would be the same as in alternative A, with possible minor disturbance after July 15. Long-term disturbance from pedestrians could be reduced by removal of existing turnouts.
>
> Conclusion — Construction activities may temporarily disturb swans after July 15, but no significant impact is anticipated.

Cultural Resources

Archeological Resources.

Analysis — Reconstruction of the road and staging areas would be designed to avoid archeologically or ethnographically sensitive sites wherever possible. If any archeological resource site, which is determined eligible for listing on the NRHP (previously identified or yet to be surveyed), would be unavoidably impacted by construction activities, then an approved mitigation plan would be developed and appropriate data recovery completed prior to initiation of ground disturbing activity. The data recovery plan, prepared pursuant to the ACHP's *Treatment of Archeological Properties*, would be submitted to the Wyoming SHPO and the ACHP for review and comment prior to the initiation of any actual data recovery.

Construction disturbance of roadside slopes would be much the same as alternative A, and the archeological sites potentially impacted by the proposed alternative would probably be impacted by activity of this alternative; however, less area of some sites may be disturbed.

Potential for disturbance of archeological resources at the proposed Fishing Bridge staging site would be the same as described under the proposed alternative. Results of the scheduled survey of the proposed Fishing Bridge staging site would be used for design of the configuration of the staging area to avoid or reduce impacts. Protective measures such as berms, fences, or hardened surfaces would be developed to prevent damage to subsurface resources during material storage. The site would be reclaimed after road construction was completed and implementation of sensitive landscape designs would minimize impacts to archeological resources during grading or other ground disturbing activities associated with area reclamation.

The information gained from consultation with Indian tribes culturally linked to areas within the park would serve to guide project planning and design in such a manner as would not impact sites or areas considered sacred by these groups. This information is regarded as confidential and is not available for release without the concurrence of the relevant modem day culture.

Conclusion — Potential disturbance of archeological resources; protection, mitigation, and recovery procedures; and use of pertinent ethnographic information gained through consultation would correspond to that described for the proposed alternative.

Historic Resources.

Analysis — Cultural resources that contribute to the historic significance of the park road system that are expected to be placed in the NRHP would be protected, preserved, and maintained according to the programmatic agreement being developed between the FHWA, the staff of Yellowstone National Park, the NPS Rocky Mountain Regional Office, and the SHPOs of Wyoming and Montana.

Reconstruction or rehabilitation of any historic structure would be conducted in accordance with *The Secretary of Interior's Standards for Rehabilitation*. Loss of any historic structure would be mitigated by HAER documentation.

All bridges along the east entrance road and the stone guardwall along the road east of Sylvan Pass would be unaffected.

Reconstruction of existing visible stone headwalls, in conjunction with culvert replacement, would mitigate adverse impacts. Removal of the over 50-year-old stone culvert headwalls that are not readily visible would result in adverse effects. At least one representative culvert should be documented according to HAER standards; however, documenting all lost headwalls would not be necessary.

Conclusion — Cultural resources would be protected, preserved, and maintained according to the programmatic agreement. Reconstruction or rehabilitation of any historic structure would be conducted in accordance with *The Secretary of Interior's Standards for Rehabilitation*. Loss of any historic structure would be mitigated by HAER documentation. All bridges along the east entrance road and the stone guardwall along the road east of Sylvan Pass would be unaffected. Historic features would be adversely affected by removal or replacement with modern structures.

Social and Economic Environment

Analysis. Short-term construction activity and inconvenience to park visitors traveling the road would be the same as described under alternative A, including 20-minute waits (or longer) for one-way traffic, delays from rough roads, dust, noise, and possible night traffic closures and late fall closures.

Park concession businesses and roadside businesses outside the park may be affected by traffic surges as described under alternative A, with no expected significant reduction in sales revenue. Effect on business in Park County, Wyoming, and Cody, Wyoming, would be similar to that described under alternative A, including potential spending by the general contractor and employees. There would be no expected impact on tourist spending from road construction.

Long-term benefits would include some of the road features of alternative A, including a smoother road surface with improved drainage features and reduced maintenance requirements. Safety improvements would include improved curve and intersection design and safety characteristics, reduced rockfall, guardrails and embankment slopes designed to reduce rollover accidents, and improved sight distance at turnouts and along the roadway.

Differences from the long-term benefits of alternative A would result from the narrower pavement. The margin of safety would not be improved for motorists recovering from steering errors, and bicyclists would continue sharing the travel lanes with motor vehicles. The existing accident rate is not high; however, whenever vehicle/bicycle accidents occur, the consequences are often serious. Bicycling pleasure would only be improved by a smoother pavement surface, and pleasure would be diminished by the risk of riding in traffic. Inconvenience would continue to motorists slowing behind bicyclists in the travel lanes. The narrower road would generally require greater driver concentration and be less enjoyable to drive compared to the wider road of alternative A.

Conclusion. Visitors traveling the road would experience short-term inconvenience from construction and long-term benefits in road design. Benefits from design would not include the safety provided by the wider lanes and shoulders of alternative A, and the design of alternative B could contribute to more accidents of greater severity than the design of alternative A.

Impact on roadside business sales revenue inside and outside of the park is not expected to be reduced. The economy of Park County and Cody may benefit from spending by the contractor and employees, and no impacts on business are expected.

IMPACTS OF ALTERNATIVE C: NO ACTION

Natural Resources

There would be no construction and no major surface disturbance on roadside slopes, rock cliffs, or geothermal features. Maintenance of the existing roadway and ditches would not be likely to disturb soil, vegetation, or geologic features on the slopes beyond ditches. There would be no significant or measurable effect on air quality, visual quality, water quality, water resources, or wetlands along the roadside from construction or maintenance of the road structure, or from traffic. The constructed flat areas and disturbed slopes visible from the road at Sylvan Pass would remain in their present condition. While these surfaces are unnaturally flat or sloped, they are probably not obtrusive to the average visitor.

The existing road and traffic probably causes some displacement of wildlife and reduction of roadside habitat use, but this is complex and difficult to measure. Most animals that are not hunted appear to habituate or become tolerant of regularly occurring, predictable human presence and use. Traffic results in some inevitable roadkill of wildlife, but there is little recorded incidence of this. There is no known or expected significant impact on bird or mammal populations from the existing road or traffic.

Four existing culverts block passage of spawning trout, but it is unknown to what degree this reduces overall spawning success.

Potential always exists for human/grizzly bear interactions that would directly impact bears, such as vehicle accidents or habituation to human food sources from illegal feeding or available garbage. Mortality caused by vehicles has been rare in the entire park, and current policies and enforcement seem effective in preventing human/grizzly problems along the roadway. The existing park road system may to some extent displace bears from habitat, but this effect is being studied and the effect that the road has on the bear population has not been quantified. Maintenance and use of the existing road are not likely to adversely affect grizzly bears.

Bald eagles are observed from the roadway, but there are no known adverse effects on bald eagles from the existing road or traffic.

Peregrine falcons are believed to forage in the general road corridor, but there are no known effects from the existing road or traffic.

Whooping cranes do not use the road corridor and there would be no effect on cranes.

Traffic and curious pedestrians may affect trumpeter swans nesting and foraging in ponds near the road along Yellowstone Lake. Nesting success is inconsistent.

Cultural Resources

There would be no effect on roadside archeological sites from maintenance of the existing road. There would be no effect on historic bridges, modern log guardrail, stone culvert headwalls, or guardwalls. These features would be maintained. The modern steel guardrailing on the Cub Creek bridge would remain, detracting from the original appearance of this rustic structure.

Social and Economic Environment

There would be no construction disturbance to visitor traffic or concession business inside the park. Traffic and business outside of the park would be influenced by reconstruction of the highway east of the park toward Cody, but this would be independent of park road maintenance operations.

The existing road surface and base material would continue to be affected by poor drainage. This contributes to excessive flexing of the base and pavement under vehicle loading, causing cracking and rutting, with a resulting rough surface. This process would continue and be accelerated by increasing traffic volumes and increasing numbers of heavy vehicles, such as motor homes and tour buses. Visitor inconvenience and complaints to park management would continue and increase as the pavement deteriorates.

Poor safety characteristics of the existing road, including vulnerability to rockfalls, would be perpetuated. Safety conflicts are described above in the "Purpose and Need" section. The result of safety conflicts from road design include increased risk of injury or death, property damage, and inconvenience that could be prevented by modern safety engineering design features. General driving and sight-seeing pleasure would continue to be diminished by the deteriorating condition of the road, compared to the recently reconstructed roads elsewhere in the park, such as between Old Faithful and West Thumb.

Maintenance costs for keeping the road open to traffic would escalate with time as pavement breaks up and base material failures continue. Increased spending to maintain this facility would be at the expense of other park facilities and programs. Continued deterioration might result in closures for safety reasons.

FUTURE COMPLIANCE

If the EA demonstrates that the project would significantly affect the environment, then a Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS) would be issued. Conversely, a Finding Of No Significant Impact (FONSI) would be issued if it is determined that there would be no significant impact from this project. A FONSI would be approved by the regional director.

A Statement Of Findings (SOF), issued for impacts to wetlands or floodplains, would also be prepared and would accompany the FONSI. The SOF would be approved by the director of the National Park Service.

In compliance with the Clean Water Act, the FHWA would ensure that a Section 404 permit from the Army Corps of Engineers for placement of fill material into waters of the United States and a national pollution discharge elimination system for storm water runoff from the Wyoming Department of Environmental Quality is secured prior to construction.

Park roads are excepted from compliance with Executive Order 11988, Floodplain Management, under NPS final procedures for implementing that order (45 FR 35916 as revised by 47 FR 36718).

All contractor activities would comply with state and federal air quality regulations and operate under applicable permits.

A programmatic agreement with the FHWA, the staff of Yellowstone National Park, and the state historic preservation officers of Wyoming and Montana, to cover Section 106 compliance procedures would be drafted and implemented by the Rocky Mountain Regional Office of the National Park Service. This agreement is expected to be written and signed in the course of calendar year 1992. It would provide generic guidelines for the protection, preservation, and maintenance of cultural resources that contribute to the historic significance of the park road system, which is expected to be placed in the NRHP (under the aspect of several historic districts) during the course of 1992 or shortly thereafter.

APPENDIX A

VEGETATION MANAGEMENT FOR CONSTRUCTION IN YELLOWSTONE NATIONAL PARK

Revegetation efforts within the park have focused on careful management of topsoil as the only available growing medium and seed source. This is based on a park policy that seed obtained from sources outside the park would contaminate the park gene pools. Although it is a conservative method, the topsoil management approach has worked well.

The park has contracted with the Bridger Plant Material Center to assist in the formation of a park seed bank. In the future seed would be available for revegetation work. The park has also tested mulches and can make this information available upon request.

All construction work within the park involving ground disturbance should follow the criteria for revegetation accepted by the park. This includes:

1. All construction would be limited to that area necessary to complete required work. No activity, including vehicle or material use or storage, would be allowed outside the predetermined zone. If vehicles are to be traveling through an area numerous times, the same tracks should be used to prevent compaction in other areas. Compacted zones must be treated (raking, aerating, and replacement of topsoil) to assist revegetation.

2. Excavation and improvement would be handled in manageable sections that reflect changes in the soil and vegetation. Trenching routes and disturbance zones would be flagged and approved by the park. All flagging and debris would be removed from the area after work is completed.

3. Sections would be rehabilitated as soon as possible. Topsoil may not be stockpiled over the winter or for longer than three months in sage brush/rabbit brush zones nor longer than six months in grass-dominated zones. Any deviation would be approved by the park.

4. Topsoil refers to the uppermost soil horizon. It is usually found in the top 2-6 inches. Topsoil would be removed and replaced from the same area. Care would be taken to ensure that topsoil and fill material are not mixed and are stockpiled in separate areas (i.e. topsoil to the right of the trench and fill to the left).

5. Vegetation over 3 feet in height must be removed prior to the removal of topsoil. Such vegetation shall be removed in a manner that least disturbs the topsoil. Topsoil may not be driven on, gouged, or compacted as vegetation is removed. Topsoil shall be removed before stumps are pushed. Any deviation from this process must be approved by the park.

6. After large trees are removed, topsoil would be removed from an area in a single cut including any vegetation that is three feet tall and under. Grubbing is not permitted.

7. Irregular land surfaces are recommended for a natural effect. Some rock outcropping and boulders could be left in place to create natural pockets for revegetation (see number 11). Deadfall snags could be stockpiled for later use on slopes that are very steep to provide catch points for soil.

8. Topsoil may not be used as bedding material. Separate bedding material would be obtained from sources approved by the park.

9. Topsoil would be replaced on site in a mixture of topsoil and vegetation associated with the topsoil, and would be reworked over the site in a manner that preserves the seed source while spreading the soil over the area.

10. No topsoil would be imported from outside the park or moved internally within the park unless approved by the park. Any imported fill would be checked for exotic plants.

11. Trees and shrubs are to be avoided if possible during trenching or excavation. Any trees removed during construction should be removed from the site unless specified by the park.

12. If replacement seed is required for revegetation in an area, the park would provide seed at cost to the contractor. Advance notice of six months to one year is required on projects exceeding 1,000 square feet.

13. Boulders unearthed during construction would be reburied or left exposed (with lower third buried) depending upon the location and extent of rock naturally occurring in the area.

14. The surface of the trench would be left mounded to allow for settling along the line.

15. If mulch is required in sensitive areas due to visibility or exotic plant infestation, the park would specify the type and depth of mulch to be used. Nitrogen would be added in small quantities to any wood product used on slopes to balance nitrogen lost through decomposition.

16. No fertilizer would be used in any revegetation work unless requested by the park.

17. If relocated due to road reconstruction, junction boxes or cans would be placed in the field and approved by the park. Location should be well screened by vegetation, topography, or large boulders.

18. All access to the site and stockpiling or staging areas must be identified by the contractor and approved by the park. These areas shall be revegetated using approved techniques upon the completion of the project.

19. All debris shall be removed from the site to an approved pit or hauled away as approved by the park.

20. Final review and inspection shall be made by the park before the work is accepted.

APPENDIX B

United States Department of the Interior

TAKE PRIDE IN AMERICA

NATIONAL PARK SERVICE
P.O. BOX 37127
WASHINGTON, D.C. 20013-7127

IN REPLY REFER TO:
A5623(660)

August 5, 1991

SPECIAL DIRECTIVE 91-6

To: Directorate, Field Directorate, WASO Division Chiefs and Park Superintendents

From: Acting Director

Subject: Field Guidance on Implementing the NPS Management Policies Re: Administrative Use of In-Park Borrow Material

This field guidance provides direction on interpreting and applying the 1988 NPS Management Policies related to NPS use of borrow pits and spoil areas (Chapter 9, Page 4). These policies contain several terms that are open to interpretation which could result in inconsistent implementation. The desire to ensure consistency among parks and avoid potential litigation is the impetus for developing specific field guidance on the administrative use of mineral materials in parks. This guidance is not applicable to coastal management issues such as navigation channel dredging, beach nourishment, dune rebuilding and natural levee repair. See NPS Management Policies Chapter 4, page 20, for guidance on shoreline management issues.

Definitions. For the purposes of this field guidance, the following terms are used:

Borrow pit - excavation from which mineral materials are taken.

Extraction or excavation site - a borrow pit or a quarry.

Functions necessary for park administration - actions defined in approved park plans or environmental compliance documents.

Mineral materials - common varieties of sand, stone, gravel, pumice, pumicite, cinders, clay, and common fill.

Spoil - native materials, e.g., soil, rock or overburden

Spoil area - disposal location for overburden or other soil or rock.

Quarry - an open pit or excavation where stone, sand, gravel or other mineral materials are obtained from open faces.

Use of In-Park Sources. In accordance with the NPS Management Policies, park managers should first look outside of parks for sand, gravel and borrow materials. In developing cost estimates for future park projects, park managers should assume that materials will be obtained from sources outside the park. In-park sources should only be considered if the following two tests are met: (1) acceptable sources exist in the park, and (2) economic factors make it totally impractical to import materials.

In determining whether "acceptable sources" exist in the park, park managers must evaluate the natural, cultural, socioeconomic, and visitor use effects of using existing and/or new sites. This guidance sets forth a series of questions that should be addressed in a written analysis evaluating the use of existing and new in-park sites. In the written analysis of new sites, park managers must address the requirements of NPS-12 (NEPA Compliance Guideline), other compliance/permit requirements, and all issues outlined below for existing pit use, including site selection criteria, reclamation plans, and economic considerations.

Potential NPS use of materials from new or existing sites on private lands inside park boundaries should be evaluated using the same process outlined for extraction from federally owned land in parks. This will require specific examination of park planning documents. For areas managed cooperatively as ecosystems, e.g., the Greater Yellowstone Area, resources outside of parks but in the ecosystem should be evaluated using the same criteria as in-park resources, subject to applicable laws.

The definition of "totally impractical" is, by necessity, case-specific. There is no set formula for determining what percentage increase in a project cost makes an outside source totally impractical. The park manager must weigh the expected costs and effects of an in-park source against expected costs and effects of outside sources to determine the acceptability of in-park sources.

Economic considerations to be evaluated for both outside and in-park sources include:

(1) cost of preparing appropriate planning documents, e.g., mineral source plan, NEPA compliance, technical studies including engineering, hydrologic, or reclamation analyses;
(2) cost of extraction of materials, and associated transportation, including equipment and labor cost;
(3) cost of damage to park roads resulting from truck traffic;
(4) cost of reclamation;
(5) traffic disruptions;
(6) health and safety implications of hauling material;
(7) cost associated with obtaining all State and local permits;
(8) potential savings of using old extraction sites for administrative purposes;

(9) benefits associated with having previously disturbed sites reclaimed;
(10) purchase price of mineral materials (if outside source); and
(11) cost of exotic plant management at project site(s) using outside sources, e.g., eradication or long term control, or costs of guaranteeing exotic species-free materials.

Monetary costs may often be greater when using sources outside of the park. However, when comparing the costs of inside sources versus outside sources, park managers should determine whether other funding sources exist which could cover the additional monetary cost of using outside sources, e.g., Federal Highway Administration, and factor that information into the analysis. Also, park managers should evaluate the possibility of extending the project over multiple years to make the use of outside sources economically feasible.

NPS Contractor Use of Borrow Pits and Spoil Areas. For purposes of this field guidance, mineral materials to be used by NPS contractors is the functional equivalent of NPS use. Contractors, including the Federal Highway Administration, performing work for the NPS on park projects may use mineral materials sources in the unit when such use is authorized by the Superintendent. However, the contractor's use of mineral materials, just as direct NPS use, must conform to NPS Management Policies, NEPA, other applicable statutes and regulations, and the criteria outlined herein.

Acceptable Sources Identified in Park Plan. Park management should ensure that acceptable sources for mineral materials are identified and analyzed in appropriate park planning documents and that the effects on natural and cultural resources have been considered and evaluated. Examples of plans in which such sources may be appropriately identified include general management plans, resource management plans, development concepts plans, and mineral materials source studies. If the park has plans for extensive mineral materials extraction, preparation of an areawide mineral materials source study may be appropriate. Planning documents addressing mineral materials sources must include appropriate NEPA and cultural resource compliance and public involvement. Parks should identify sites for extraction and disposal of mineral materials in advance, in anticipation of emergency situations, e.g., road slides, landslides, or floods, in the appropriate planning document. Additionally, managers should be aware that there can be cumulative effects from opening or continuing to use a number of mineral materials sites inside the park. Cumulative effects should be identified and analyzed in appropriate planning and/or environmental compliance documents.

Written Analysis. Any actual or potential in-park use of mineral materials from either new or existing sources requires a written analysis. This analysis shall include: basic site information such as name of pit, map, access, size, location in the park, relationship to other facilities, and management zoning. Answers to the enclosed questions, along with a determination of acceptability signed by the Superintendent comprise the administrative record for the use of an existing site. The written analysis should be used in determining what constitutes appropriate NEPA compliance, e.g., categorical exclusions, environmental assessments, or EISs. Analyses of new sites must address, in addition to the requirements of NPS-12, all issues outlined herein for existing pit use.

Use of In-Stream Sites. Generally, in-stream sources should not be considered. Stream channels and floodplains are generally recognized as sensitive resources and are not usually suitable as sources for sand, gravel, or borrow. However, under some conditions, use of these areas my result in fewer or shorter-term impacts than alternative upland sources. These sources of borrow may be considered for use when it can be demonstrated through appropriate scientific study that all of the following are met:

(1) upstream and downstream channel stability will not be affected;
(2) water quality and aquatic and terrestrial habitats will not be adversely impacted;
(3) extraction pits can be designed to resemble natural features and function in a manner that does not encourage morphologic or vegetative changes;
(4) the extraction site will refill with mineral materials similar in characteristics to the removed borrow; and
(5) replenishment will occur in a reasonable timeframe.

Additionally, when an in-stream source is used, post-extraction monitoring must be conducted to assess the degree to which the above criteria are achieved. No new sources will be established on designated wild or scenic rivers.

Use of Pits In Designated or Proposed Wilderness Areas. Borrow pits are not permitted in designated or proposed wilderness areas, with the exception of small quantity use of borrow for trails, which must be in accordance with an approved wilderness management plan.

Effects on Natural and Cultural Resources. In some cases, active and inactive mining sites may not have had adequate environmental analyses performed at the time of initial disturbance. Consequently, additional environmental analyses should be completed prior to the continued use or reactivation of an existing site. Resource evaluations should include: water, soils, vegetation, fish and wildlife, archeological and historic sites and landscapes. Determination of impacts, including an assessment of their significance and cumulative effects, must be made in accordance with appropriate NPS guidelines. The potential for exotic plants to be introduced, and to spread and persist, should be evaluated along with requirements for subsequent control.

Effects on Socioeconomic Resources. In evaluating alternative sources of borrow and selecting an actual source, park managers must consider the socioeconomic effects. These include effects on:

(1) existing local and regional land use patterns and zoning;
(2) direct and indirect effects on local and regional businesses and residents;
(3) the local and regional economy;
(4) other agencies (Federal, State, and local) and their projects; and
(5) concessions.

The socioeconomic analysis should also address impacts on park operations, e.g., need for additional park staffing, changes in staff schedules, traffic circulation, safety, and security.

Effects on Visitor Experience. The NPS strives to minimize the public's awareness of extraction activities, including the sights, sounds and smells associated with those activities. Extraction sites should not be located in areas of primary visitor use and should not be visible from areas of concentrated visitor use, nor from primary viewsheds. Continued use of existing sites should be evaluated for impacts on visitors and the visitors' experience. Factors to be considered include:

(1) type and degree of impacts;
(2) visibility of sites;
(3) expectation of visitors (wilderness vs. development zones);
(4) park zoning considerations; and,
(5) surrounding or adjacent views.

Reclamation. All mineral material sites in park units ultimately should be reclaimed. Park managers should ensure that an adequate reclamation plan is developed before authorizing use of in-park sources of mineral materials or continuing use of existing pits. Post-extraction use of the sites should be defined at the time site disturbance is being considered. This may include returning the area to pre-extraction use, reclaiming the site to be in harmony with surrounding areas, or using the site for administrative purposes, e.g., storage or staging areas. Areas to be used for administrative purposes should be recontoured and reclaimed to the maximum extent possible while still allowing for administrative use. Park managers must consider the cumulative effects of multiple administrative sites in determining appropriate post-extraction uses.

Reclamation plans must address:

(1) health and safety problems on site;
(2) control of active sedimentation/erosion problems;

(3) drainage issues;
(4) need to recontour (lay back) to allow revegetation;
(5) timeframe for achieving reclamation;
(6) reestablishment of native vegetation;
(7) sources of native plant material;
(8) control of exotics;
(9) topsoil storage and handling;
(10) access;
(11) contaminated or hazardous soils; and
(12) site monitoring.

Some aspects of reclamation can be most effectively accomplished concurrently with the extraction operation. Control of erosion and exotic species may need to be an ongoing effort. For long-term operations, portions of the disturbed area should be reclaimed as the operations proceed into other areas. All extraction sites developed or reopened for specific projects should be reclaimed within the timeframe of that project.

Park managers are encouraged to provide technical assistance to adjacent land owners in the preparation of reclamation plans where external source development, use, and reclamation could have potential adverse impacts on park resources.

Questions

In order to implement this guidance, a written analysis addressing the following questions should be prepared. These questions apply to both new and existing borrow pits and spoil areas. A written analysis must be prepared in conformance with the provisions of the NPS Management Policies.

1. What is the proposed project?

2. What type and amount of mineral material is necessary to complete the project?

Evaluating External Sources

3. Are the necessary mineral materials available from sources outside the park?

4. What is the cost to complete this project using mineral materials from outside sources and what are the general environmental impacts?

5. Do economic factors make it "totally impractical" to import materials?

6. What are the pertinent socioeconomic factors at the site and in the affected area?

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Evaluating Internal Sources

7. Do previously disturbed sites exist inside the park that provide the quality and quantity of mineral materials needed? [Impact analysis and other environmental compliance documents will be more extensive if the site is new.]

8. Will the extraction operation remain in the existing disturbed area or will it expand onto previously undisturbed lands?

9. How is the site identified and zoned in appropriate park planning and/or environmental compliance documents?

10. What are the characteristics of the proposed extraction operation?

11. What are the natural resources at the site and in the affected area?

    a. Vegetation, including exotic plants
    b. Wildlife
    c. Soils
    d. Water resources
    e. Soils and Geology
    f. Air Quality
    g. Paleontological resources
    h. Other

12. What are the cultural resources at the site and in the affected area?

13. What are the impacts to park visitors, and what can be done to mitigate these impacts?

14. What are the impacts to natural and cultural resources, and what can be done to mitigate these impacts?

15. What are the impacts to the socioeconomic resources of the area, and what can be done to mitigate these impacts?

16. Describe how the proposed action could contribute to cumulative impacts over a period of time.

17. Would the action, when added to other past, present, and reasonably foreseeable future actions, have a significant effect?

18. Describe appropriate post extraction use and its consistency with planning documents.

19. Can the site be effectively reclaimed to accomplish the desired post extraction use?

20. What are the steps necessary to reclaim this site? Has a reclamation plan been prepared for this site?

21. Have compliance requirements been met?

    a. NEPA
    b. NHPA, Sections 106 and 110
    c. Threatened and Endangered Species
    d. Floodplains and Wetlands, 404 Permits
    e. State and Local Permits (depending on jurisdiction)
    f. Air Quality Permits
    g. Others

22. What is the cost of the in-park source including the mitigation and reclamation measures identified above?

Park Manager Certification

Based on the answers to the above questions, and on analysis of the issues related to the extraction of mineral materials in this project # ______________, borrow site ____________ (# or name) has been determined as an acceptable site/source. Outside park sources have been evaluated and determined to be totally impractical from a budgetary standpoint. Effects to natural and cultural resources are not significant. Socioeconomic impacts and the effects on visitor use have been analyzed and are deemed to be acceptable. A reclamation plan for the site has been prepared. This action is consistent with all applicable compliance, permitting, and laws.

____

Superintendent's Signature and Date

RESPONSES TO QUESTIONS FROM SPECIAL DIRECTIVE 91-6

1. See "Alternatives Considered - Alternative "A": Proposal"
2. See "Material Source and Staging Sites"
3. See "Alternatives Considered but Rejected"
4. The cost of road material is dependent on many factors. The FHWA determined the most significant factors to be the cost of material acquisition (royalty), the cost of processing and placement, and the cost of transportation. Each of these costs are variable. Royalty costs are dependent on the availability of material in a particular area, as well as on the competitive condition of the local market. Processing and placement costs include the cost of site preparation, processing plant move-in, installation, operation, maintenance, and equipment amortization. These costs vary depending upon project size, the degree of processing required, labor costs, compliance with environmental regulations, and the costs of site rehabilitation and reclamation. Transportation costs are dependent on numerous factors, including the type of equipment used, hauling distance, condition and gradient of the haul route, load weight restrictions, fuel and licensing costs, and travel time. (Parkwide Road Improvement Plan Environmental Assessment, Yellowstone National Park, 1992)
See also "Alternatives Considered but Rejected"
5. See "Alternatives Considered but Rejected"
6. See "Affected Environment - Social and Economic Environment"
7. See "Alternatives Considered - Alternative "A": Proposal - Material Source and Staging Sites"
8. Same as #7
9. Roadway corridors, including the Sylvan Pass, the proposed material sources, are zones as "park development" areas.
10. Same as #7
11. See "Affected Environment - Natural Resources"
12. See "Affected Environment - Cultural Resources"
13. See "Alternatives Considered - Alternative "A": Proposal - Traffic Management" and "Environmental Consequences - Impacts of Alternative "A" - Social and Economic Environment"
14. See "Alternatives Considered - Alternative "A": Proposal - Mitigation Stipulations" and "Environmental Consequences - Impacts of Alternative "A" - Natural Resources and Cultural Resources"
15. Same as #13
16. See "Environmental Consequences - Impacts of Alternative "A" - Cumulative Impacts"
17. See "Environmental Consequences - Impacts of Alternative "A" - Natural Resources" and "Environmental Consequences - Impacts of Alternative "A" - Cumulative Impacts"
18. Same as #7
19. See "Alternatives Considered - Alternative "A": Proposal - Reclamation"
20. Same as #19
21. An environmental assessment has been prepared. See "Environmental Consequences - Natural Resources and Cultural Resources" and "Future Compliance"
22. See "Alternatives Considered - Alternative "A": Proposal - Cost"

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PREPARERS AND CONSULTANTS

PREPARERS

David Bathke, Natural Resource Specialist
William Conrod, Planning Team Captain
David Fritz, Cultural Resource Specialist
Richard Lichtkoppler, Resource Economist
Jacqueline Richy, Natural Resource Specialist

CONSULTANTS

Denver Service Center

James LaRock, Planning Coordinator, Branch of Roads and Trails
Howard Wagner, Chief, Branch of Roads and Trails

Rocky Mountain Regional Office

Marcy Culpin, Regional Historian
Michael Duwe, NEPA Compliance Specialist
Cam Hugie, Chief, Branch of Roads, Landscape, and Architectural Design
Ann Johnson, Archeologist

Yellowstone National Park

Joseph Alston, Assistant Superintendent
Robert Barbee, Superintendent
Susan Consolo Murphy, Endangered Species Coordinator
Steve Frye, Assistant Chief Ranger
Kerry Gunther, Bear Biologist
Wayne Hamilton, Research Geologist
Tim Hudson, Chief of Maintenance
Roderick Hutchinson, Geothermal Geologist
Terry McEneaney, Resource Biologist
Mary Meagher, Ungulate Biologist
Daniel Reinhart, Bear Biologist
John Sacklin, Supervisory Outdoor Recreation Planner
Cathy Smith, Cultural Resource Specialist
Jim Sweaney, Resource Management Specialist
Nancy Ward, Civil Engineer
Jennifer Whipple, Botanist
Lore Williams, Landscape Architect

National Park Service Midwest Archeologist Center

Ken Cannon, Archeologist, Midwest Archeological Center

Federal Highway Administration, Western Federal Lands Division

George Fekaris, Highway Engineer
David Heckman, Highway Engineer
Grant Lindsay, Highway Engineer

U.S. Fish and Wildlife Service

Ronald Jones, Fishery Biologist, Yellowstone National Park
Steven Oden, Billings, Montana
Jayne Roybal, Cheyenne, Wyoming

U.S.D.A. Forest Service

Gary Edson, Shoshone National Forest

U.S. Army Corps of Engineers

Edwin Gooley, Riverton, Wyoming

As the nation's principal conservation agency, the Department of the Interior has basic responsibility for most of our nationally owned public lands and natural and cultural resources. This includes fostering wise use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people. The department also promotes the goals of the Take Pride in America campaign by encouraging stewardship and citizen responsibility for the public lands and promoting citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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